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Editorial Notes

Equipping for the Future

It is good from time to time to hear the experiences of those in charge of the smaller undertakings, to learn how their particular problems were met and overcome. It may seem late in the day to say that only on the basis of an adequate supply at all times of gas of uniform quality can there be efficient gas service. Yet, can all the smaller undertakings be satisfied that their carbonizing, washing, and purification plants, and storage are of adequate capacity to meet increased demands, and that their mains are of ample dimensions to carry an increased load? It is a question asked by Mr. Robert Sturrock, of Ardrossan, in his Paper on the modernizing of a 50-million works which he read at last Friday's meeting of the North British Association of Gas Managers. There is, we suggest, no justifiable general affirmative answer. We cannot sympathize with those who feel that what has been sufficient for the past will do for the future; any such sense of security is false. On the other hand, it is a disheartening task for those who, convinced that the introduction of improvements is essential not only to the expansion but to the retention of present gas sales, cannot convince their Committees or Directors that expenditure in this direction would be justified by the result. Of recent years the cost of plant and equipment has been favourable to the purchaser. Now, with increasing trade prosperity, increasing costs of raw material and labour, plant capital cost will tend to increase. Those undertakings which have failed to take advantage of the low prices ruling of late may well have cause for regret.

Of recent years, too, manufacturers of plant have by no means neglected the requirements of the small undertaking. On the contrary, they have definitely laid themselves out to cater for these requirements; and as labour costs figure so largely in the cost of gas manufacture on the smaller works, particular attention has been paid to this aspect. As an example of what we mean, there are now available automatically operated water gas plants eminently suitable for the small works operating horizontal retorts. A considerable section of Mr. Sturrock's Paper is devoted to this matter. It is now nine years since Mr. Sturrock presented to the North British Association a Paper on the subject of "Gas Blending." In it he detailed the construction of a "Simplex" water gas plant installed at the Ardrossan Gas-Works in 1925, and at the same time gave particulars of the working results of this plant in combination with horizontal retorts. He also gave excellent reasons why the plant was installed. He had arrived at the conclusion that the best calorific value to employ in his particular circumstances was 450 B.Th.U. per cu.ft. He was making gas of 550 B.Th.U. in the horizontals, and quite rightly he objected to "overpulling" as a means of bringing down the calorific value. There is no need for us to discuss the evils of this practice; suffice it to say that in 1927 Mr. Sturrock expressed himself as being fully satisfied with the operation of the water gas plant from the points of view of cost of gas into holder and the supply of a mixed coal gas and water gas low in inerts.

Results at Ardrossan

Last Friday he expressed himself as being still happier since the plant was converted to automatic operation at the latter end of 1934. Installation of this "strikingly simple" automatic gear, which "gives such flexible working," has considerably improved working conditions; and at the present time an additional "Simplex" water gas plant is being erected at the works, which, states Mr. Sturrock, will enable him to obtain more uniform "makes" of gas per ton and of a more uniform quality. His declared calorific value is now 430 B.Th.U. per cu.ft.

He mentions that in the year 1926-27 the yield of gas per ton of coal carbonized was 17,120 cu.ft. of a calorific value of 439 B.Th.U. per cu.ft., giving a production of 75·1 therms per ton of coal. In August last, the yield was equivalent to 89·8 therms per ton, the gas again being of a calorific value of 439 B.Th.U. It is, of course, incomplete for Mr. Sturrock to express results, when making a mixed gas, in terms of "per ton of coal carbonized," without showing at the same time the amount of coke available for sale per ton of coal purchased for treatment. We are impressed not with high makes as such, or with high throughputs as such, but with overall efficiency as indicated by the production of the cheapest therm.

However, we are well satisfied that since he has had control of the Ardrossan Gas-Works Mr. Sturrock has done a first-class job of work pursuing a policy of gradually introducing plant to increase gas making efficiency and the capacity of the undertaking. The improvements introduced have coincided with increased sales. Production costs have in recent years been reduced considerably, and these reductions have been passed on to the consumer in a lower charge for gas. The Ardrossan Undertaking is in a position to cope with a demand for gas certain to be increased by industrial developments in the district. Above all, the Undertaking is equipped to give good gas service, which is a different matter altogether from being able merely to give a supply of gas.

Gas Service at Greenock

An example of a medium sized undertaking which, anticipating growing demands for gas in the future, has equipped itself accordingly, is provided by the Greenock Corporation Gas Department. An outline of the Department's activities on the distribution and selling sides was given by Mr. R. D. Keillor, the Engineer and Manager, in his Paper, "Local Aspects of Town Gas Service," to the North British Association. On the distribution side, the policy may be fairly described as continuous watchfulness. In regard to mains and services, for instance, there is a predetermined plan of overhaul. This plan of yearly maintenance of the distribution system in first-class condition has everything to recommend it. The routine renewal of mains is accompanied by thorough overhaul of the services—which in the result helps towards a low unaccounted-for gas figure, is a safeguard against accidents, and ensures that there is adequate pressure at the inlet to consumers' meters. Nor should considerations of pressure end at the inlet to the meter. The best of meters, remarks Mr. Keillor, must eventually suffer from neglect and develop a disease known as "high pressure-absorption;" neglected meters are also liable to stick without much warning. In this regard he advocates the practice of regularly replacing a certain number of meters each year according to a pre-arranged programme.

Selling effort can only meet with its proper return on the basis of an ample supply of gas and good service. This, Mr. Keillor well recognizes. We have drawn attention to the thoroughness which characterizes the supervision of the distribution system at Greenock, and the same thoroughness is evident in the steps taken to ensure lasting customer satisfaction. As an example, a system of regular inspection and maintenance of all appliances on the district was brought into operation fourteen years ago; and this "free" service, which costs 0·12d. per therm of gas sold, has proved profitable in more ways than one. That sales-mindedness at Greenock is no new thing is well demonstrated by the fact the Department has boasted a spacious gas showroom since 1913; and without elaboration Mr. Keillor mentions that all the usual modern sales methods are in operation, and that the facilities offered to customers are thoroughly appreciated. In regard to sales, a point which appeals to us is the close analysis made at Greenock, where the different fields of gas usage are properly classified. This type of analysis is invaluable in tracing the success or otherwise of efforts directed towards the promotion of sales in different spheres and in showing the relative importance of the different classes of consumer.

Methods of Charge

The result of the policy which Mr. Keillor outlines is that, in spite of a diminution of population in the Burgh of Greenock, gas sales have never stood higher, and that the consumption per consumer has increased during the past ten years from 32,000 to 36,000 cu.ft. A sliding scale of charges for gas used through ordinary meters was adopted in 1920 and "has proved to be of great assistance in widening the scope of gas service." It will be noted that this system of charge (selected "because it appeared best suited to local conditions") is not extended to prepayment consumers, who are still held to the old flat-rate method of charge, which is definitely non-promotional. Yet prepayment consumers at Greenock account for 47% of the total gas sold, and their contribution to the total revenue from gas is a matter of 53%. Considering that relief is given to the ordinary consumer after he has consumed 20 therms a quarter, and considering, too, that his rate for the first 20 therms is lower than that charged to the prepayment user, it would appear to require explanation why the prepayment consumer is offered no encouragement to burn more gas. The more so in view of the fact that gas service at Greenock includes the provision of free cookers and range hotplates to all alike, and that, at the present, including "miscellaneous appliances," over 20,000 appliances are out on the district on free loan.

Mr. Keillor states that the question of introducing multi-part tariffs has been seriously considered, but that "the existing scale is so firmly established and so well suited to local conditions that it does not appear desirable to introduce any other system of charging in the meantime." We do not quite understand what he implies by "in the meantime." Nor do we agree with the implication of the statement he sets out dealing with the possibilities of employing two-part tariffs at Greenock. The statement is, of course, a necessary preliminary to the putting into force of any two-part tariff. It is necessary, as he has done, to arrive at the service charges required to maintain the present revenue from gas sales from the various classes of consumer. But without amplification the statement tacitly assumes that a two-part tariff is not promotional, and that in establishing it no risk should be taken. Surely the assumption that a two-part tariff will be of no benefit is not correct in the light of the experience of those undertakings operating such a tariff.

With the general remarks of Mr. Keillor on research and improved gas service we are, however, in entire accord. The design, finish, and performance of gas appliances have been greatly improved in recent years as the result of research and co-operation of manufacturers and buyers; but to regard the present position with complacency would be fatal. We feel, however, that any such attitude will find no place in our Industry, which has learned to value research and investigation, and is ever more ready to apply the results of such research to practice. There is no doubt that science will play an increasingly important part in the future improvement of town gas service.

Report of the C.E.B.

The Central Electricity Board has published its Eighth Annual Report, covering the year ended Dec. 31, 1935. In the first part it is announced that during the year the amount of electricity generated in Great Britain was 17,565 million units, which represents an increase of 1,900 million units over the 1934 figures. The increase is doubtless due in some measure to trade revival during the period under review.

The second part of the Report deals with the Grid system. It is stated that at the end of the year approximately 4,075 miles of transmission lines had been erected, and that about 2,880 miles of line operate at 132,000 volts, and the remainder at 66,000 and lower voltages. The increase in consumption has been met by new generating plant of a capacity of 277,000 kilowatts. With regard to the standardization of frequency, it is reported that change has been effected in respect of 669,286 kilowatts of generating plant out of a total of 914,061 kilowatts; standardization has involved work on the premises of over 340,000 consumers.

The third part of the Report deals with the trading of the Board, which is now in operation throughout the country except in North-East England and in North and South Scotland. The electricity necessary for the purposes of the Board is purchased from selected stations,

and these selected stations are under the necessity of re-purchasing from the Grid the amount of electricity required for supply in their own area. The cost of re-purchase is either on the basis of the Grid tariff, or at the cost of production with the addition of a proper proportion of the expenses of the Grid.

It is pointed out that owners of selected stations cannot suffer a loss because they may claim from the Grid any amount which they are required to pay for the re-purchase of electricity above the costs which would have been incurred in generating a similar supply under conditions of independent operation. This does not appear to us to be a soothing syrup to consumers within the areas of selected stations who were led to anticipate from the construction of the Grid a cheap and abundant supply of electricity. Such consumers have, at present, no promise of any decrease in price, but merely some kind of guarantee against an increase.

With regard to non-selected stations, the Electricity Supply Act, 1926, provided that no such undertakers could be compelled to close down their stations and purchase from the Grid unless the cost of the Grid supply could be shown to be less than the cost of production (exclusive of capital charges). The Report therefore states that "Since the Grid tariff has to provide for capital charges in generating stations and on the Grid it follows that it is only the non-selected stations with unusually high production costs which can be closed down compulsorily under this Act." To that extent we would submit that the original scheme of the Grid has failed. It is well known that it became necessary for the Central Electricity Board to induce non-selected stations to take their supplies from the Grid by offering to supply at rates lower than the Grid tariff. To this end agreements were made which at the time were probably illegal, and it became necessary for Parliament to pass the Electricity (Supply) Act, 1935, for the purpose of legalizing arrangements of this character. It appears from the Report that 29 arrangements of this kind have been made. Another departure from the original scheme authorized by the recent Act is that power was given to the Grid to supply to large consumers, such as Railway Companies, direct, and thereby in some measure to compete with the ordinary supply undertakers.

The fourth part of the Report is devoted to finance. The maximum authorized borrowing power of the Board is £60 millions, of which £50 millions have already been borrowed—a figure far in excess of the original estimate. The Report states that the account shows a credit balance of £1,021,211 2s. "which the Board regard as very satisfactory." It is not unfair to point out, however, that the Board has in the past paid, and still is paying, interest out of capital. If regard was had to interest and sinking fund charges, which should correctly be charges against revenue, the appearance of the accounts would not, we fear, have been so satisfactory.

It may be early days to attribute success or failure to the Grid scheme, but it must be remembered that the only savings which can be achieved by the Grid are savings in the cost of generation. A far heavier item is the cost of distribution, and upon the expense of distribution the operations of the Grid can have but little effect.

A Good Year

It is regrettable that the condition of haze produced by complications in Europe and Africa should have prevented the excellence of the figures revealed at the close of the nation's financial year from being as generally appreciated as certainly would have been the case in times freer from international political uncertainties. After several years that were none too good, the country has enjoyed a recovery which is full of promise for the future, both for the individual and for the great national industries, including our own.

It is true that the position of the taxpayer, as taxpayer, seems unlikely at the moment to be improved directly to any considerable extent, but he can derive consolation from reflecting that the like burden of taxation weighs less heavily during a period of business recovery than at a time of general depression, and also from the knowledge that what has prejudiced his chances of real relief has been the determination to build up a stronger Britain. This latter consideration may well be worth more to him in the future than a small reduction in the rate of income-tax would be at the present time—desirable as such a reduction must be from a business point of view. This may well be one of the rare occasions upon which a bird in the hand would not be worth two in the bush. More than once the "JOURNAL" has voiced the view that a substantial remission of the existing heavy load of direct taxation is necessary to the peak of business prosperity, but if this remission must be still further postponed, most people will agree that the circumstances not only justify such postponement, but emphatically demand it.

Of course, when Budget Day arrives the Chancellor may have some surprises in store, but for the moment we should be satisfied to know that on March 31 the nation's financial year closed with a real surplus of £15,407,926, which is reduced to just under £3,000,000, by the application of some £12,000,000 to the repayment of debt. Admittedly, the Chancellor is cautious in his estimates; but even so, there is sound reason for the utmost satisfaction in the fact that the revenue has exceeded Mr. Chamberlain's budget estimate by £18,500,000, and is £36,400,000 higher than a year ago, while the expenditure has been only £16,000,000 more than was anticipated. There have been increases in revenue exceeding the estimates under almost every head. We know that exceptionally heavy expenditure lies before us; the figures of revenue for the financial period just completed afford evidence that the nation is making such strides on the road of recovery as will be of the greatest help to it in meeting this expenditure.

Forthcoming Engagements

April.

16.—S.B.G.I.—Council Meeting at 2.30 p.m.
18.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting.
18.—WESTERN JUNIOR ASSOCIATION.—Meeting at Plymouth. Presidential Address of Mr. J. H. Dyde.
18.—WALES AND MONMOUTHSHIRE JUNIOR ASSOCIATION.—Annual General Meeting at Caldicot.
21.—I.G.E.—Gas Education Executive Committee, 11 a.m.; Gas Education Committee, 2.30 p.m.
23.—I.G.E.—Joint Lighting Committee, 2.30 p.m.
24.—N.G.C.—Annual Meeting of Members in Scotland at Central Station Hotel, Glasgow, at 2.30 p.m.

May.

1.—I.G.E.—Liquor Effluents and Ammonia Committee, 11·15 a.m.; Joint Research Committee, 2.30 p.m.
1.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Annual Business Meeting.
5.—I.G.E.—Research Executive Committee, 2.30 p.m.
8.—NORTH OF ENGLAND G.M.A.—Annual Meeting at Newcastle and Lecture by Prof. J. W. Cobb, C.B.E.
6-7.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Spring Meeting at Lincoln.
7.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Spring Meeting at Northampton.
7.—MIDLAND JUNIOR ASSOCIATION.—Annual General Meeting. Address by Mr. E. W. Smith.
9.—SCOTTISH EASTERN JUNIOR ASSOCIATION.—Annual General Meeting.

Personal

Mr. J. MacIldowie, Managing Director of the Kiveton Park Coal Company, Ltd., is to join the Board of the Rotherham and District Collieries Association, Ltd.

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Retiring from active service after 55 years as a Director of Messrs. Gittings & Hills, Ltd., Paint and Varnish Manufacturers, of Tower Works, Nechells, Birmingham, a presentation was recently made to Mr. R. M. Hills at a dinner dance given in his honour.

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Mr. Stephen H. Stokes, Technical Assistant to the Elland-cum-Greetland Gas Company, has been appointed Junior Technical Assistant to the Buxton Corporation Gas Department, and will commence duties after Easter.

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A presentation was made at King's Lynn on March 30 by the employees of the King's Lynn, Downham Market, and Swaffham Gas Undertakings to Mr. J. V. Knight, Engineer and Manager, upon his departure to take up a similar appointment at Trowbridge, Bradford-on-Avon, and Warminster. Mr. George Fuller, Chief Clerk, made the presentation on behalf of the employees.

* * *

Mr. W. J. Grey, General Manager and Secretary of the Alliance and Dublin Gas Consumers' Company, and Mrs. Grey were this week presented with a table canteen of silver cutlery by the staff to mark the celebration of their silver wedding jubilee. The presentation was made by Mr. C. H. Leech, Assistant Secretary, who with other speakers paid tribute to Mr. Grey's many fine qualities. Mr. Grey in reply said he was proudly embarrassed by the cascade of compliments. He paid tribute to his wife's never-failing loyalty, devotion, and understanding during his long service with the Company.

In recording the presentation made last week to Mr. F. S. Hunter, who has relinquished his duties as Engineer and Manager at Ormskirk to take up the position of Engineer and Secretary at Bridlington, we stated that both Undertakings were controlled by the British Gas Light Company, whereas, of course, they are both members of the United Kingdom Group.

Obituary

The death is announced of Mr. John J. Sangster, Assistant Manager of the Peterhead Corporation Gas Department, on March 28.

Mr. G. M. Gill sends the following appreciation of R. W. Kershaw, whose death recently occurred:

I should like to express in your columns the real loss which the Gas Industry has sustained by the death at the early age of 32 of R. W. Kershaw, Distribution Manager of the Gloucester Gas Light Company.

He was a young man of outstanding ability and came to the Gloucester Gas Light Company in September, 1934, from the Blackpool Corporation, and soon showed the knowledge which he possessed of district work in an energetic and enterprising manner. He made considerable progress in the short time during which he was in charge of the Company's Distribution Department, and it is indeed sad that he should be removed from our midst at the beginning of a career which would undoubtedly have been of great advantage to himself, the Company, and to the Gas Industry.

News in Brief

The Output of the Lincoln Undertaking shows an increase for the year ended March 31 of 63,445,000 cu.ft., from 571,271,000 cu.ft. to 634,716,000 cu.ft., or more than 11%.

Sanction for a Loan of £31,633 for extensions at the Cleckheaton Works, as part of a plan to concentrate production at Cleckheaton, is being sought by the Spenborough Urban District Council.

Application to the Board of Trade for an Order under Section I of the Gas Undertakings Act, 1929, is intended to be made by the Altrincham Gas Company, one of the objects of which is the raising of £30,000 further additional capital.

To Provide for the Transfer to the Mossley and Saddleworth Gas Company of the Undertaking of the Mossley Corporation, the Mossley and Saddleworth Company have applied to the Board of Trade for an amendment of the Draft Special Order made in December, 1934.

Electricity Failed over a large part of Burnley and the neighbouring village of Harle Syke. The electric current failed at seven o'clock on Saturday evening, March 29, and did not come on again for twenty-five hours. This is the worst breakdown the department had ever experienced.

A Special Order under the Gas Undertakings Acts, 1920 to 1934, is intended to be applied for to the Board of Trade by the Wandsworth and District Gas Company with the object *inter alia* of transferring to and vesting in the Company the Undertaking of the Walton and Weybridge Gas Company.

The Erection of a New Gasholder has been decided upon by the Directors of the Kelty Gas Company. The new holder will have a capacity of 150,000 cu.ft. The present storage capacity is considered inadequate. Work on the new holder is to begin immediately. The contractors are Henry Balfour & Co., Leven.

For Sale by Tender the Lea Bridge District Gas Company are offering £30,000 4% irredeemable preference stock at a minimum price of issue of £105%. A deposit of £10 per £100 must accompany a tender, and the balance of the purchase money is to be paid on or before April 30, 1936. Allottees will in September next receive two months' dividend in respect of the period May 1 to June 30. Thereafter the dividend will be payable half-yearly in March and September. The stock will be registered and the certificates issued free of expense.

We Have Received from Mr. A. L. Curtis, P.O. Box 61, Chatteris, Cambridgeshire, a copy of "Sands, Clays, and Minerals," which consists of 192 pages with 93 illustrations and includes many interesting articles on such subjects as rotary drilling fluids, manipulation of Canadian radium, niobium and its uses, and mining on the Gold Coast.

The Next Meeting of the Manchester and District Association of Gas Engineers will be held on Friday, July 3, when a visit will be paid to the Glenden Street Stove Department and Bradford Road Gas-Works of the Manchester Corporation Gas Department, followed by luncheon at the Manchester Town Hall, and a further visit to the Works of Messrs. West's Gas Improvement Company, Ltd.

The New Belfast Gasholder is to be of the waterless type. The Engineer, Manager, and Secretary, Mr. J. D. Smith, with the Chairman and Vice-Chairman of the Gas Committee, while attending the Gas Conference at the British Industries Fair, inspected several waterless gasholders, and were satisfied that this was the most suitable type for local requirements. Their recommendation has been approved.

Application for a Special Order is to be made to the Board of Trade to authorize the transfer of the Kirkburton Gas Light Company, Ltd., and the Shelley and Shepley Gas Light Company, Ltd., to an undertaking to be called the Kirkburton, Shelley, and Shepley Gas Company, Ltd.; and to authorize the new Undertaking to acquire lands for gasworks purposes, to settle the limits within which the Company shall supply gas, and for other purposes.

In his Remarks at the Luncheon of the Southern Association of Gas Engineers and Managers on March 27, Mr. S. E. Whitehead, of Southampton, in proposing the toast of "The Visitors," was reported as having stated that the Plymouth and Stonehouse Gas Light and Coke Company, Ltd., increased its output during the past twenty years by 20%. Mr. Whitehead writes to point out that the actual increase during this period was 50%.

The Eastern Counties Gas Managers' Association are holding their 91st Half-Yearly Meeting on Wednesday, May 6, at Lincoln, in charge of whose gas undertaking is their President, Mr. G. Wright. An excellent programme has been arranged, including a Golf Competition on the Tuesday, special tours for the ladies during the business meeting, when the President will deliver his Address, and visits to a number of industrial works on the Thursday.

For the Third Time, although not successive year, Henry R. Gray, of Hendon Works, Sunderland, won the Directors' Challenge Shield and Gold Medal at the Annual First-Aid Competition of Sunderland Gas Company. Miss D. Drury, daughter of Mr. C. Dru Drury, Engineer and Director of the Company, presented the prizes, Mr. Drury presiding.

A Public Enquiry has been ordered by the Board of Trade to be held into the Stretford and District Gas Board's scheme to erect a gasholder in Sale, where the scheme has aroused widespread opposition. Originally the Gas Board proposed to erect the gasholder on their own land in Glebelands Road, but after a search of the district Sale Council offered the disused sewage works' site in Dale Road for sale for the purpose. Two petitions of protest have been organized against the scheme.

The Progress of the Widnes Gas Department, which has had a most successful year, has been brought to the notice of its consumers and the general public by a most striking full-page newspaper advertisement drawing attention to the fact that the quantity of gas supplied by the Undertaking during the year was 10% (39 million cu.ft.) more than the quantity supplied during the year ended March, 1935. "Domestic and Industrial Consumers," runs the advertisement, "are showing an increasing appreciation of the true value of gas by Using Larger Quantities."

The Unfortunate Electricity Consumer has apparently always to reckon with the possibility of a failure of supply. At least one is led to believe that electricity supplies are bound to fail periodically. And this from the Swansea Electrical Engineer, Mr. J. W. Burr, whose recent explanation of the failure of the electric supply in Sketty, Killay, and Mumbles on Saturday, March 21, was reported in the *South Wales Evening Post* for April 1. This report runs: The engineer added that undertakings were bound to get these interruptions, and Swansea has as little as any in the country.

Record Results Were Achieved by the Newport (I.O.W.) Gas Company at their cookery demonstrations and exhibition of gas appliances which were held recently in the Queen's Hall. This was officially opened by the Deputy-Mayor on March 16 and remained open until March 20. Over 1,200 persons attended these lectures, and as many as 169 entries were received for the cake-baking competition, for which prizes were presented by the Mayoress. Great interest was shown in the demonstrations by Miss E. S. Price, of the Radiation Research Kitchen, and the complete dinners cooked in a "New World" oven without attention proved as usual a great attraction.

The Tenders for the £37,200 ordinary stock and £20,000 4% perpetual debenture stock which Messrs. A. & W. Richards, 37, Walbrook, E.C. 4, offered on behalf of the Directors of the Slough Gas and Coke Company were opened on March 31. For the ordinary stock the tenders sent in amounted to £89,705, at prices ranging from £160 1s. down to the minimum of £152. The lowest price to secure allotment was £155 11s., and the average obtained was £159 8s. 9d. per £100. The tenders sent in for the £20,000 4% debenture stock totalled £50,000, and ranged from £107 10s. down to the minimum of £103. The lowest accepted price was at £103 7s. 6d. per £100 and the average obtained was £104 2s. 11d.

South London Gas Lighting

South Metropolitan Company Secures Five Years' Contract Covering 106 Miles of Streets

The South Metropolitan Gas Company has been awarded a five years' contract for the re-lighting of all the streets in the Borough of Wandsworth which lie within its area of supply.

The scheme will cover a total of 106 miles, of which nine miles are main thoroughfares and the remainder secondary and residential roads. The system employed will be the Company's new "Supervia" directional gas lamp, with high pressure for the main roads and low pressure for the rest.

One section of the scheme, including a stretch of the main Croydon and Brighton Road through Streatham, has been completed, and when the whole has been finished the area should, if not the best, be among the best examples of public lighting in the Metropolis.

Women's Gas Council

Cardiff Branch Visit Grangetown

Members of the Cardiff Branch of the Women's Gas Council to the number of 116 paid a visit to the Grangetown Works of the Cardiff Gas Light and Coke Company on March 31. The party was conveyed to Grangetown in special motor coaches and, after being conducted over the Works, were entertained at tea on the kind invitation of the Cardiff Gas Light and Coke Company.

Harrogate Visit Ideal Home Exhibition

Seventy members of the Harrogate Branch of the Women's Gas Council visited London on March 31, and spent a busy and instructive afternoon at the Ideal Home Exhibition at Olympia. They were afterwards entertained to tea, when they had the opportunity of meeting Miss Halpin and exchanging ideas with members of the Women's Gas Council from Brighton, Kingston, Epsom, and Altrincham. After tea the Harrogate party had to catch their train for the North, but the other members, through the courtesy of Messrs. Electrolux, Ltd., enjoyed a special demonstration of the internal mechanism of a gas refrigerator.

Another Interesting Ideal Home Exhibit

We reproduce above a photograph of the joint display by Stoves, Ltd., and Falk, Stadelmann, & Co., Ltd., at the *Daily Mail* Ideal Home Exhibition, reference to which was made in our review of the exhibits in last week's "JOURNAL." This stand features, in the main, the firm's "Newhome" and "Bakerloo" cookers, fitted with the new "Matchless" lighter. These models are finished in a range of attractive colours.

Altrincham Lighting Developments

"Supervia" Lamps Installed

With the object of demonstrating the excellent results obtainable with improved gas lighting, the Altrincham Gas Company has erected two lighting installations in Stamford New Road, Altrincham, and in Stockport Road, Timperley.

Mr. F. A. West, Engineer and Manager of the Company, states that the local councils concerned have agreed to pay for the gas used, and they have the option to purchase these installations complete. The Stamford New Road installation is of 12 Keith's "Supervia" high-pressure lamps with the light source 25 ft. above the road level and spaced 40 yards apart. The Stockport Road installation consists of 15 Sugg's "London" lamps, each comprising 12 mantles in alignment, class "D" lighting.

It is understood that six additional gas lamps are to be erected between Timperley Station and Acresfield Road, Timperley, and the burners on the existing lamps on the station bridge have already been increased in numbers. The Altrincham Gas Company has a fully prepared policy

of making local residents gas-conscious, and we understand from our local correspondent that this enterprise is but a beginning of their progressive programme for the future.

Gas Salesmen Come to London

Large Gathering at Annual Meeting of Circles

"There is no class of the community possessed of such influence in relation to its actual membership as the medical profession; and it is most essential that doctors should be kept informed of all there is to know about the advantages of one's commodity—its superiority over possible competitors from a heat and energy standpoint, and, in fact, that this great Industry is one which deserves full

Mr. H. Bottomley receives the Goodenough Gold Medal from Mr. H. Stanley Taylor.

support." The foregoing remark was made by Mr. Charles C. Looker (General Manager of the Crookes Laboratories) in the course of an address on "Marketing to the Professions," which he gave before the Annual Meeting of Gas Salesmen's Circles, held on April 3 at the Caxton Hall, Westminster, under the Chairmanship of Mr. H. Stanley Taylor (President of the B.C.G.A.).

There was an excellent attendance of members from all parts of the British Isles, and the only disappointing feature of a most successful day was the absence, through indisposition, of Sir Francis Goodenough, C.B.E., who was therefore unable to present personally, as is his wont, the Goodenough Gold Medal.

After a few words of welcome by the Chairman, Mr. H. C. Smith (Chief Engineer to the Tottenham and District Gas Company) referred to the importance of the sales side, and said how encouraging it was to see the response to-day when such a gathering of salesmen was arranged; only a comparatively few years ago it would have been impossible to call together a meeting of gas salesmen at all. The electrical industry, observed Mr. Smith, was going to have a very keen fight to take away the heating and cooking load from gas. One had only to read some of their recent advertisements—some of which might be construed as being definitely derogatory to gas—to see how concerned they were at the way gas was keeping the heating and cooking loads. If electricity had to descend to the form of advertising sometimes adopted at the present time it must mean that they were rather afraid of gas.

The Chairman of the various district Circles having given a report on their individual activities during the past session, Mr. Stanley Taylor went on to make the presentation of the Goodenough Gold Medal to Mr. H. Bottomley for his Paper before the Manchester Circle entitled "The Sales and Fittings Department—Points for Discussion," which had been judged to be the best of the Papers qualifying for the B.C.G.A. Area Silver Medals. This Paper was published in the "GAS SALESMAN" for February last.

The Silver Medal awards for the best Papers read to each of the District Circles during the year were made as follows:

Circle.	Author.	Title of Paper.	Published in the "GAS SALESMAN" for—
Cornish . .	F. G. Kingwell .	"Publicity and Canvassing"	September, 1935
West Riding .	V. Wood . . .	"Display—Its Effects on Sales"	June, 1935
Midlands . .	I. Greenwood. .	"Gas in Industry"	February, 1935
Scottish . .	R. Cowie, Jnr. .	"Stimulating Interest in Gas"	December, 1935
London . .	H. H. Westbrook	"Application of Gas to Central Heating and Bulk Hot Water Supply"	January, 1935
North London	E. T. Lyne . .	"Grasping your Opportunities"	May, 1935
Kent . . .	J. W. Harrison .	"The Gas Unit"	December, 1935
Wales . . .	H. S. Bartlett .	"Problems on the District"	May, 1935

Mr. Charles Looker then gave his address, which created a considerable amount of interest, and for which he was accorded a hearty vote of thanks on the proposition of Mr. R. Cowie, Jnr. (Chairman of the Scottish Circle), seconded by Mr. R. G. Marsh (Chairman of the Midlands Circle). Mr. W. D. Rowe (Manager of the B.C.G.A.) moved a vote of thanks to Mr. Taylor for presiding over their meeting and also to Mr. H. C. Smith for his presence. He was sure they would agree that the active personal interest of Directors, Engineers, and Managers in the work of the Circles was an inspiration to them all.

A tribute to the assistance rendered, through the medium of the Press, to the sales side of the Industry in the Irish Free State was paid by Mr. F. J. Edmonds, of Waterford. In Ireland, he said, they covered a very wide area, and if they were to form a Salesmen's Circle it would mean that many of them would have to travel, perhaps, a hundred miles in order to attend the meetings. But by reason of the activities of the other Circles they were provided by the Press with food for thought and received encouragement to go forward in the great struggle they were fighting on the other side of the water.

After lunch the members proceeded to Olympia to visit the Ideal Home Exhibition. A full report of the meeting will be given in this month's "GAS SALESMAN."

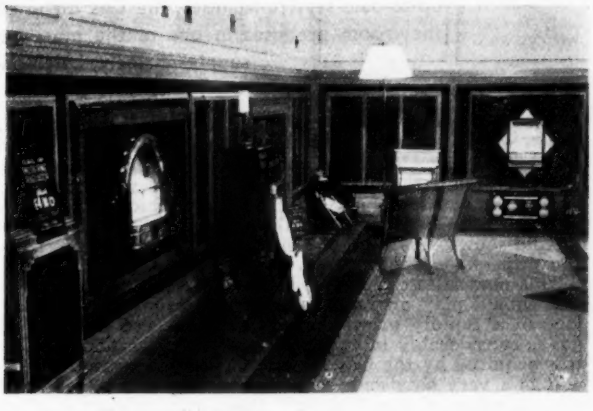
At the Opening of the Truro Showrooms

A charming little incident in the course of the opening ceremony of the Truro Gas Company's new showrooms on March 27, to which reference was made in last week's "JOURNAL." The photograph shows Anne Williams, daughter of the local Gas Manager (Mr. R. J. Williams), presenting Dr. E Leslie Burgin (Parliamentary Secretary to the Board of Trade), who formally opened the new premises, with a tin of biscuits—an entirely Cornish product, cooked by Cornish gas.

Fine New Showrooms

Opened by

Dundee Gas Department



Reference was made in last week's "JOURNAL" to the new Showrooms recently opened by the Dundee Gas Department. Our photographs show two views of the very fine premises, which comprise two handsomely appointed sections, one for the display of gas fires, &c., and the other for kitchen equipment. The premises have two large floodlighted windows, the lighting being provided by three troughs each with 16 mantles.

Practical Gas Demonstrations at Abertillery

Great Public Interest Created

Considerable success attended a recent series of gas cooking and laundry-work demonstrations at Abertillery. Mr. J. E. Day (Chairman of the local Gas Committee) presided over the opening ceremony, and referred to the excellent gas lighting of Church Street, Abertillery, which, he said, was acknowledged to be one of the best lighted streets in South Wales and Monmouthshire. This reflected great credit on their Gas Engineer and Manager, Mr. Maycock, whose enthusiasm and untiring efforts to make the Department a success they appreciated. Recently Mr. Maycock had been successful in securing the contract for the lighting, heating, and cooking for the new Masonic Hall in Abertillery in open competition with other fuels.

This photograph of the demonstration platform at Abertillery is particularly interesting by reason of the excellent detail brought out by only three seconds exposure under three Sugg's directive gas lamps visible at the top of the picture.

The various demonstrations were given by representatives from John Wright & Co., Ltd., and W. H. Dean & Co., while a range of many gas appliances was arranged for inspection in the demonstration hall. At the conclusion of the demonstrations, Mr. Maycock expressed his thanks to the demonstrators and also to Messrs. Lyons for their co-operation and hospitality, and to his staff for their untiring efforts in preparing the hall and exhibits.

During the five days the demonstrations were being held, not far short of a thousand persons visited the hall.

Electricity Displaced at Chesterfield

Gas to Cook for 3,000

That Chesterfield's largest firm, whose pay roll exceeds 3,000, had substituted gas for electricity in their canteen for cooking purposes, was mentioned at the opening on Monday, March 30, of a gas exhibition arranged by the Chesterfield Corporation Gas Department.

Councillor Miss Florence Robinson, J.P., opening the exhibition, said her firm prepared 400 dinners a day at their welfare centre at Bradbury Hall. Electricity was first tried, but it proved too costly and too uncertain. Gas was then tried and they had found it most satisfactory in every way. It had never let them down, and she did not think she could pay gas a higher tribute. Alderman Geo. Clark, J.P., who presided, said he read in a London newspaper the other day "Don't let work kill you. Let electricity do it." Gas, he claimed, did the work, without a sacrifice of life!

Voicing thanks to the Chairman and Councillor Miss Robinson, Mr. H. Davies, Engineer and Manager to the Chesterfield Corporation Gas Department, said he was very pleased to hear Councillor Miss Robinson's commendation of gas. It was a fact that his Department had kept the equipment going without the slightest trouble.

The Modern Gas Cooker—By Cannon

New Season's List

The cover of the new season's cooker list of the Cannon Iron Foundries, Ltd., is rather significant because it strikes a note that continues throughout this very attractive publication. The green clear-cut characters on a primrose yellow background of "tiles" are both straightforward and striking.

A perusal of its contents immediately recalls this cover to mind for the predominating colour scheme is two shades of green and cream and primrose. Clean lines and simple straightforward design that should win the approval of the most fastidious of housewives do the rest. However superficially one may view their productions, sight should not be lost of the fact the firm have devoted very special attention to technical perfection and due prominence is given to the "Autimo" oven heat controller. Actually the "Autimo" is the opening bid to the contents. Then follows the well-known "Champion" embodying what are claimed to be entirely new features in oven construction. A very excellent addition that will instantly appeal to the kitchen-proud is a chromium-plated plate rack. The "New Challenge" and "Suburban," both very popular models, are next dealt with, and are followed by plans of hotplates for the various models. The "Champion Centenary" and the "Centenary," eye-level models in mottled grey, are also described. Other models of domestic cookers, large scale cooking apparatus, wash boilers, and water heaters complete this artistic booklet.

Gas Light and Coke Company Open New Showrooms in Their Eastern Territory

Modern and Attractive Premises at Leigh-on-Sea

Pursuing their progressive policy of following up their extensions of area with the provision of up-to-date service facilities, the Gas Light and Coke Company inaugurated on March 31 new showroom premises in one of the more recently acquired eastern districts of their area of supply—namely, Leigh-on-Sea, near Southend, in Essex.

The new showrooms at 77, The Broadway, Leigh-on-Sea, which were formally opened by His Worship the Mayor of Southend (Mr. Alec H. White, J.P.) in the presence of a distinguished gathering of prominent local residents, supersede older and less convenient premises which were taken over with the Southend Gas Company in 1932. Moreover, the old showrooms were in a side street some distance from the principal shopping area.

This new sales centre will be easy for everyone to reach and should play an important part in promoting gas service in a rapidly growing district, whose consumption of gas is considerably in excess of that when the undertaking was acquired by the Gas Light and Coke Company.

It is a very handsome modern building with a good display window of the "open" type, thus giving a clear view into the interior of the showroom. Inside the predominant colour is green, and all the latest appliances from refrigerators to gas pokers can be seen and demonstrated. A particularly attractive range of gas fires indicates to the consumers of Leigh what a colourful setting the latest models will make. There are twelve different hues to choose from. The same remarks in regard to colour finishes

The Demonstration Platform in the Leigh Showrooms.

are equally applicable to the fine range of cookers, while the special display of water heaters is particularly noteworthy. These are tastefully arranged in an alcove, illuminated from concealed lights above, and discharge into a stainless steel trough. Certain of the water heater models are shown in coloured finishes, and a point is made of the newly introduced gas circulator for attachment to the existing boiler system.

Behind the enquiry desk is a "gadget" table, where are displayed a full range of all the things that can be plugged in to gas, including gas kettles, irons, small portable heaters, table lamps, waffle irons, pokers, and curlers. Laundry equipment in the shape of washing machines and drying cabinets also finds a place in the new showrooms.

At the rear of the room is a platform fully equipped as a model kitchen, where special cookery demonstrations will be given. A description of these new premises would be incomplete without reference to the very pleasing lighting fittings shown. The beautiful pendants and brackets now available, all, of course, on switch control, would seem to indicate that the Gas Light and Coke Company is not going to drop a single lighting consumer without a struggle. The whole showroom gives an impression of comfort combined with efficiency, the decoration scheme being particularly commendable.

The Opening Ceremony.

The door of the new premises having been formally opened by the Mayor of Southend with a key which was handed to him by Mr. R. W. Foot (General Manager of the Company), the guests passed into the showrooms, and after a brief inspection of the various appliances to be seen therein, they were conveyed in motor-buses to the Elm Hall. Here the Mayor and Mayoress, together with Mr. Foot, received the guests, and tea was subsequently provided at the kind invitation of the Gas Light and Coke Company, the Mayoress being first presented with a charming bouquet by the daughter of a member of the local staff of the Company.

Mr. R. W. Foot, in the course of a few words of welcome to those present, apologized for the absence of the Governor, Sir David Milne-Watson, and said how sorry they were that he was prevented from being with them that day on account of important Government business.

Continuing, Mr. Foot said that they were very grateful to the Mayor for coming there that afternoon to give their new enterprise in Leigh his blessing. They appreciated very much that the first citizen of the great Borough of Southend should spare the time in his busy life to perform a ceremony of this description. And they particularly appreciated the fact that he was accompanied by the Mayoress, who not long since had presided in a very charming way over the first meeting of the Southend Branch of the Women's Gas Council. They were happy to see there that afternoon some of the first members of this Council, which he believed would become a very important National body.

This little enterprise of theirs in Leigh, went on the General Manager, was one of which they were very proud. The history of the Leigh Gas Undertaking was an interesting one, going back over many years. A considerable time ago, when Leigh was a very small place, the gas was supplied by a private Company. The next step was the acquisition of that Undertaking by the Leigh Urban District Council. Then the Borough of Southend, spreading its boundaries, took Leigh under its banner, including, of course, the Gas Undertaking. The next step was a feeling that private enterprise might come into the picture again, and the Undertaking was transferred to the Southend Gas Company, which was the position in 1932 when the Gas Light and Coke Company acquired that Undertaking. That was where they were to-day, and that was the reason why their hosts on that occasion were the Gas Light and Coke Company.

No Regrets.

The Gas Light and Coke Company did not regret taking over Southend in any way at all, and they hoped no one in the district regretted it either; he did not believe they had any reason to do so. One or two interesting facts would indicate how their business had developed since they took over control of the gas supply. It would still be fresh in their memories that shortly after taking over they suffered a very serious blow in the loss of the street lighting. This represented a considerable loss to the Company; but they did not sit back. They decided that the only thing to do was to replace the business from elsewhere; and that serious loss—amounting to 5% of their output in the district—had now been filled up by increased private and industrial consumption. Mr. Foot also pointed out that since they took over in 1932 they had increased the number of employees connected with the Undertaking by no less than 60%; they employed 155 more men than were employed by the old Southend Gas Company.

The Company were determined, continued Mr. Foot, that the Southend gas supply should be just as good as it was possible for the supply to be. They found the old gas-works at Southend not up-to-date or in accordance with modern ideas of gas-works; so it might not, therefore, be news to them that work was proceeding the results of which would be to give Southend one of the finest works in the country.

For many years, as they knew, there had been a small gas showroom in Leigh, right away from the main shopping centre and inconvenient to those coming to the town to shop. The Company therefore felt that the proper thing to do was to bring their "shop" where the other shops were, so that the public could call at their showrooms with no inconvenience when they were doing their other shopping. They did not consider that it was right for their consumers to have to go out of their way in order to avail themselves of the Company's services.

In conclusion, the General Manager once again thanked the Mayor and Mayoress very much for coming there that afternoon

and all those present for giving their blessing to their new enterprise in Leigh.

"Happiness on Tap."

The MAYOR OF SOUTHEND said that he was sure it gave them all very great pleasure to be there that day to open the Company's magnificent showroom. When he stepped inside the premises the slogan immediately came into his mind, "Happiness on Tap." The Gas Light and Coke Company was among the largest ratepayers in that town, and the Corporation had always endeavoured to work amicably with them, and he was sure they always would.

The Gas Light and Coke Company, he said, was the largest of its kind in the world; it used more than three million tons of British coal every year and supplied 540 square miles with light and heat. The Company's increased output last year amounted to 5 million cu.ft., which obviously meant less smoke and soot. Nine hundred factories in London used gas for processes where the temperature had to be regulated to fine limits. There had been a record sale of gas appliances. The Company employed 20,000 persons, and 17,000 of these were co-partners, owning more than £1,000,000 of the Company's stock, and were thus personally interested in the wellbeing of the undertaking, which was a great thing in a company of this kind. The Company's Sports Association had 12,500 members and owned 100 acres of sports grounds in different parts of London, in addition to recreation rooms at their various offices where the staff could enjoy indoor sports. He congratulated the Company upon their enterprise, and wished them every happiness and success in the future not only in that town but throughout the Company in general.

North British Association of Gas Managers

Spring Meeting at Glasgow

The Spring Meeting of the North British Association of Gas Managers was held in the Ca'doro Restaurant, Glasgow, on Friday, April 3, under the Presidency of Mr. JAMES DICKSON, of Kirkintilloch.

Ex-Provost J. R. RUTHERFORD, of Kirkintilloch, Convener of that Burgh's Gas Committee, extended a very cordial welcome to the Association. He said that his Town Council were honoured and delighted that the Association would be their guests in September, and he assured them of a very hearty welcome. They were very proud of Mr. Dickson in Kirkintilloch, and they felt that his progressive mind had contributed largely to the success of their Gas Undertaking. He concluded by wishing the Association a very successful conference.

The PRESIDENT, in proposing a vote of thanks to Ex-Provost Rutherford, said that the latter had been a very good friend to him and, being the Convener of the Gas Committee, had been able to help him in many ways.

Mr. JAMES JAMIESON (Edinburgh), on behalf of the Association (of which he is Senior Vice-President), said that they were very glad to have Mr. Dickson, who was one of the foremost Gas Managers in Scotland, as their President. He asked ex-Provost Rutherford to convey the thanks of the Association to the Magistrates of Kirkintilloch.

The PRESIDENT said that he greatly appreciated the honour the Association had conferred on him by electing him their President; he would do his best to uphold their fine traditions.

The HON. SECRETARY (Mr. A. Kellock) then announced that apologies for absence had been received from the Presidents and Secretaries of The Institution of Gas Engineers and of kindred Associations, as well as from members of their own Association. He then intimated that this year they had to record the loss, by death, of the following members:

Mr. W. S. Brown, of Giffnock, had been their oldest Extraordinary Member and had joined the Association in the early 70's. He was a pioneer in the development of the Giffnock district of Glasgow and a Director of the Busby Gas Company. He died on Jan. 2 last in his 91st year.

Mr. A. H. Hamilton, of Glasgow, had also been a Senior Member and became an Extraordinary Member in 1899. Mr. Hamilton was a man of many activities. He built up a large and extensive business in Glasgow and in his latter years was a Magistrate of that City. He died on Feb. 2 in his 78th year.

Mr. W. G. Readdie, of Anstruther, was a member of a family which had been associated with the Gas Industry in Fifeshire over a long period and had many business interests in the County. He became a Member of the Association in 1892. Mr. Readdie took an active part in public life, being 33 years a member of Anstruther Town Council and Provost for four terms. He died on March 29 at the age of 68.

Mr. T. K. Leckie, of Glasgow, was a former Extraordinary Member of the Association.

As a mark of respect for these members the meeting stood in silence for one minute.

Papers were then presented by Mr. R. D. Keillor and Mr. R. Sturrock. These, together with a report of the discussions which followed, will be found on other pages of this week's "JOURNAL."

Luncheon.

Following the meeting luncheon was held in the Banqueting Hall of the Ca'doro Restaurant and 173 members were present.

After the Loyal Toast, Mr. JAMES BELL (Dumbarton) proposed the toast of "Our President." Mr. Bell said that he was very privileged to have the duty of proposing this toast. When Mr. Dickson was assisting him at Kirkintilloch he had been greatly impressed by his personality, and the success of the Kirkintilloch Undertaking had increased by leaps and bounds under Mr. Dickson's management.

The Readers of the Papers—Mr. R. Sturrock and Mr. R. D. Keillor.

The PRESIDENT, replying, expressed his pleasure that such a large number of members had attended the luncheon. He had been very proud to succeed Mr. Bell at Kirkintilloch. His predecessors there, Mr. Wilson, Mr. McLeod, and Mr. Bell, had left him a very fine heritage, and much of the success of the Undertaking was due to them. Mr. Dickson said it was very difficult to express his gratitude

for the honour they had conferred on him, and he hoped that the North British Association would continue to prosper.

Works Visit.

In the afternoon the members of the Association visited the Glasgow Corporation Workshops and Showrooms in Sauchiehall Street. There, a novel arrangement was seen whereby each fitter applied at the end of each day for the material he required for the following day, this material being placed in his box before morning. The members were then taken to the Milan Street Workshops. The members showed much interest in the various operations, particularly the renovating of black cookers and fires. These appliances were incinerated to remove all grease, sand-blasted to obtain a clean, smooth surface, sprayed with enamel, dried, and fired. The finished article looked very attractive. At the conclusion of the inspection the members were entertained at tea by the Glasgow Corporation.

The PRESIDENT asked Mr. J. W. McLusky (Glasgow) to convey to his Committee the thanks of the Association for the hospitality they had received that day. The visit, he said, had been a most interesting and instructive one.

Mr. MCLUSKY, replying, said that the North British Association and the Glasgow Gas Department had been good friends for over sixty years, and his Committee had been very glad to invite the Association to be their guests.

The PRESIDENT also thanked the Hon. Secretary of the Association for his efficient organizing, which was largely responsible for the success of the meeting, and Mr. Kellock, in thanking the members for their appreciation, said that he would be amply repaid by a similar attendance at the Autumn Meeting at Kirkintilloch.

Golf.

A most successful outing was enjoyed by forty-one members of the Golf Circle at Bogside, Irvine. The weather was excellent, a stiff breeze adding to the fine golfing test of the course which was in very good condition. An informal meeting of the Golf Circle was held at the close of play, Captain Fulton presiding. Mr. Dickson presented the prizes and was accorded a vote of thanks on Mr. Kemp's proposal. Replying, Mr. Dickson said he was honoured by their invitation to hand over the prizes. Mr. J. O. Scott, Hon. Secretary, announced that they were indebted to Captain Fulton for gifting the first prize in each section. On Captain Fulton's proposal thanks were accorded to Mr. Scott for the efficient manner in which he had carried out his duties. It was unanimously agreed that the members' thanks should be conveyed to the Irvine Golf Club for the courtesy extended to them. The Captain then informed the members that the Committee had put forward two proposals which would be submitted at the next meeting of the Golf Circle. The first was, that the membership of the Golf Circle should be limited to ninety-six, comprising forty-eight Gas Engineers and forty-eight Trader members. There were at present forty-eight Trader members and forty Gas Engineers and the past practice of electing a member of either section only when one was elected from the other would be discontinued and election would be made as vacancies in each section allowed. The second proposal was that there should be a club membership badge.

RESULTS OF GOLF COMPETITION.

J. Winson Scott Silver Cup.—Douglas H. Munro, Glasgow.

HANDICAP PRIZES.

Section I. (Handicaps 1-9)—

	1st	R. Stewart, Auchterarder
	2nd	W. A. Campbell, Buckie
	3rd	R. B. Waddell, Polmont
Tie	4th	Alistair Grant, Edinburgh
Tie	5th	J. Pollock, Glasgow
	6th	W. Davidson, Glasgow

Section II. (Handicap over 9)—

	1st	Douglas H. Munro, Glasgow
	2nd	E. V. Chalmers, Dunblane
	3rd	David Fulton, Helensburgh
Tie	4th	L. Gardner, Lenzie
Tie	5th	E. W. King, Elland
	6th	James Bell, Dumbarton
Tie	7th	R. Sturrock, Ardrossan
	8th	J. R. Gentry, Irvine

G. A. Harvey & Co. (London), Ltd.

New Complete Catalogue

We have received a copy of the new complete catalogue of Messrs. G. A. Harvey & Co. (London), Ltd., Greenwich Metal Works, London, S.E. 7. One readily appreciates the great variety of products which the Company manufactures after a perusal of this publication of well over six hundred pages.

Profusely illustrated from cover to cover, there are many sections of interest to the Gas Industry. The sectionalization, incidentally, renders reference to any particular subject a comparatively simple process despite the generous size of the catalogue.

Readers of the "JOURNAL" will no doubt find of special interest the sections dealing with steel plate work, perforated metals, and wire weaving on pages 52-53, 587-608, and 147-390 inclusive. Also detailed in the catalogue are the "Easiboil" portable gas washing machine.

Atmospheric Pollution

Exhibition at Science Museum

The most comprehensive educational exhibition dealing with the question of smoke abatement and of atmospheric pollution which has yet been held in this country is to be opened by Sir Kingsley Wood, M.P., the Minister of Health, at the Science Museum, London, in October next. It is being specially designed to show the harmful effects of polluted atmosphere on health, buildings, vegetation, works of art, fabrics, and food, as well as the difficulty and danger caused to aviation.

Sections of the exhibition are being arranged by the Department of Scientific and Industrial Research, with the co-operation of other official bodies and representative organizations of the electricity, gas, oil, and solid smokeless fuel industries. During the month the Annual National Conference of the National Smoke Abatement Society will be held at the Science Museum. A special day is to be given over to discussion of the municipal aspects of smoke abatement by representatives of the 100 municipal authorities throughout Great Britain, who are affiliated to the Society. Other days are to be devoted to industrial and domestic as well as general considerations of the problem.

B.B.C. Annual, 1936

Useful Book of Reference

We are indebted to the British Broadcasting Corporation for a copy of this volume. The Annual, which is profusely illustrated, will be useful to listeners as a book of reference, as it contains rules for S.O.S. messages; B.B.C. addresses; particulars of arrangements for visits to London and Provincial studios; lists of members of councils and committees advising the Corporation; besides details of weather forecasts and the Time Signal service. Its price is 2s. 6d., or 3s. by post. Applications should be addressed to the B.B.C. Publications Department, Broadcasting House, London, W. 1, or to the B.B.C.'s Regional Offices.

The Municipal Year Book, 1936

A Complete Record

The 1936 edition of "The Municipal Year Book and Encyclopædia of the Local Government Administration," which is published by the Municipal Journal, Ltd., 3-4, Clement's Inn, Strand, W.C. 2, at 30s., comprises altogether fifty sections—two more than the 1935 edition—and extends to 1,644 pages, the same number as last year's edition. Apart from its general utility in many directions, it affords a permanent record of the salient events in Local Government in the year which witnessed the centenary of the passing of the first Municipal Corporations Act in this country.

As usual, complete records are given of the activities, personnel, and officers of Municipal Corporations, County Councils, Metropolitan Authorities, and Urban and Rural District Councils; and details are also given of Scottish and Irish authorities, joint authorities in Great Britain, &c. In the light of the reviews of county districts the particulars relating to urban and rural district councils have entailed careful revision. A comprehensive review of highway developments is given. Street lighting, electricity supply, gas supply, housing, slum clearance, &c., are among the branches of the administration which are fully and expertly dealt with. The outstanding features of local government legislation again form a comprehensive section, and a succinct and careful review of law cases in 1935, compiled by a barrister-at-law, is given.

THE RESTRICTED TREATMENT OF Benzoles with Sulphuric Acid before Stabilization with Gum-Inhibitors*

by
W. H. HOFFERT, G. CLAXTON, and E. G. HANCOCK, of the National Benzole Company, Ltd.

I. Introduction.

When high-strength sulphuric acid was employed almost exclusively for refining benzoles, practically the whole of the unsaturated compounds present were destroyed. Usually, this treatment, which was carried out almost invariably on the batch principle, caused a substantial reduction in the total sulphur and a stable and colourless product was obtained. Although, with coke-oven benzoles and those produced at gas-works in horizontal retorts, the total losses involved might amount to up to 15% of the crude benzole, the process on the whole was simple in its operation and such difficulties as were met with were confined to emulsification during washing, to the production of sulphur dioxide and free sulphur during the subsequent refractionation, and to the disposal of the acid-tar. With vertical-retort benzoles the losses were often higher and more serious difficulties were met with in washing.

The modern tendency is to conserve as great a proportion as possible of the unsaturated compounds. Sulphuric acid is still found to be a most useful reagent for bringing about a preliminary " cleaning-up " of the crude material, without necessarily destroying the unsaturated compounds, but new problems have arisen in connection with its use. The problems are concerned with the amounts and strengths of acid necessary to bring about a desired effect, such as removal of colour, odour, or sulphur, with the minimum destruction of the unsaturated compounds.

II. The Action of Sulphuric Acid on Unsaturated Hydrocarbons.

The chief action of sulphuric acid on the unsaturated hydrocarbons is to cause a polymerization of these hydrocarbons to higher-boiling compounds or resinous material. Under certain conditions—*e.g.*, with acid of intermediate strength—some of the low-boiling unsaturated hydrocarbons are converted into di-polymers of a more stable character, which have boiling points still within the motor fuel distillation range. With acid of high concentration, however, the polymers formed are usually non-volatile, most of them being separated with the acid-tar, the remainder being left dissolved in the benzole, from which they are subsequently removed by distillation. In general, di-olefines are more readily polymerized by the acid than are the mono-olefines. Besides polymerization of unsaturated hydrocarbons, it has been reported that the acid also causes condensation of these hydrocarbons with aromatic hydrocarbons,[1,2,3] or even that aromatic hydrocarbons may condense with paraffins.[4]

Brooks and Humphrey,[5] in work of fundamental importance on the action of sulphuric acid on unsaturated hydrocarbons, showed that when oils containing these hydrocarbons are treated with sulphuric acid, neutral sulphuric esters of the type $\frac{RO}{RO}\!>\!SO_2$ are formed. These neutral esters, which remain dissolved in the oils, are not removed by washing with aqueous alkali, and their decomposition during the subsequent distillation is largely responsible for the troubles due to the formation of sulphur dioxide and free sulphur often encountered in the acid-treatment of motor fuels of an unsaturated character. Brooks and Humphrey concluded that the proportion of these neutral esters formed is inversely proportional to the relative amount of acid used, and increases with increasing strength of the acid and with rise of temperature.

In addition to the polymerized products and sulphuric esters mentioned above, there is also the possibility during the acid-washing process of the production of alcohols. Thus, it is well known that alcohols can be obtained by the action of sulphuric acid on unsaturated hydrocarbons,[6] and in fact alcohols are now manufactured commercially by the treatment with sulphuric acid of gases containing olefines and of distillates obtained by cracking fractions of petroleum.[7] It is generally assumed that the alcohols are formed by hydrolysis of sulphuric esters, although Brooks has suggested that the esters are really formed from the mono-hydrate of sulphuric acid, since the esters formed from ordinary sulphuric acid are relatively stable. Norris and Joubert[8] consider it possible that the formation of an alcohol from an olefine may be due to the direct addition of water to the double bond under the activating influence of sulphuric acid upon the water, the acid, alkyl sulphate, being subsequently formed. It has been concluded by Michael and Brunnel[9] that with the simple olefines the tendency to form alcohols and alkyl sulphuric esters decreases with increasing molecular weight, being a maximum with the amylenes and hexylenes. With increasing molecular weight and increasing strength of acid, polymerization becomes the principal reaction.

Most workers consider that high-strength acid favours the production of di- and higher-polymers, which are more stable to the acid than the original olefines. Ormandy and Craven,[10] however, have concluded from experiments, in which they dissolved various olefines in 98% sulphuric acid, that the colourless oils which separate under these conditions are open-chain paraffins, and that with less concentrated acid the oils that separate are mixtures of olefine polymerides and paraffins. It would appear, therefore, that there is a further possibility of paraffins being formed from unsaturated hydrocarbons under certain conditions during acid treatment.

III. The Action of Sulphuric Acid on Pyridine Bases.

Pyridine bases in refined benzole are undesirable, because in large concentrations they give the fuel an objectionable odour and in the presence of unsaturated hydrocarbons even traces tend to cause the formation of colour during storage.[11] When complete removal of unsaturateds was undertaken, the presence of traces of pyridine bases had little effect on colour, but the introduction of processes aiming at the conservation of the unsaturated hydrocarbons in benzoles rendered the elimination of pyridine bases essential.

Although it has long been known that pyridine bases are removed by sulphuric acid, there is very little information in the literature as to the best strength of acid to employ for removing this compound in the presence of unsaturateds, phenols, and sulphur compounds.

IV. The Action of Sulphuric Acid on Sulphur Compounds.

The chief sulphur compounds in crude benzoles are carbon disulphide and thiophen and its derivatives. Carbon disulphide, hydrogen sulphide, and mercaptans can be determined fairly accurately in crude benzoles, but no method is known of determining thiophen and its derivatives in the presence of unsaturated hydrocarbons with any degree of accuracy. Hence, it is usually assumed that in benzoles the sulphur freed from hydrogen sulphide and mercaptans, determined by subtracting the sulphur present as carbon disulphide from the total sulphur, is present as thiophen and its derivatives, although actually part of this sulphur

* Abridged and revised Report of the Research Laboratory, National Benzole Co , Ltd., 1934.

[1] Tarasov and Popova. Neft. Choz., 1930, **18**, 260, 992; Chem. Abstr., 1930, **24**, 3,347; 1931, **25**, 406.

[2] Spilker and Schade. Ber., 1932, **65**, 1,686; *cf.* also Ber., 1890, **23**, 3,169.

[3] Kruber. Brennstoff-Chem., 1932, **13**, 187.

[4] Morrell and Egloff. World Petrol. Congress, 1933, **2**, 10.

[5] Brooks and Humphrey. J.A.C.S., 1918, **40**, 822; Brooks, "The Non-Benzenoid Hydrocarbons," 1922, 106; see also Condrea, Rev. Petrol., 1911, 61; Hoffert, Rept. Joint Benzole Res. Comm., 1929, p. 148; Gas Eng., 1929, **46**, 161; Taylor, Coke-Oven Managers' Year Book, 1933, 373.

[6] Brooks. "The Non-Benzenoid Hydrocarbons," 1922, 127.

[7] Norris and Davis. J.S.C.I., 1929, **48**, 70T; Little, J.S.C I., 1929, **48**, 202T.

[8] Norris and Joubert. J.A.C.S., 1927, **49**, 873.

[9] Michael and Brunnel. Amer. Chem. J., 1909, **41**, 118.

[10] Ormandy and Craven. J.S.C.I., 1928 **47**, 317T; 1929, **48**, 293T; J. Inst. Petrol. Tech., 1931, **17**, 185.

[11] Hoffert and Claxton. Gas World, 1935, **102**, Coking Sect. 53.

in some benzoles may consist of other sulphur compounds, such as sulphides and disulphides.

Ever since Meyer[12] discovered thiophen in 1882, and showed that it could be removed from coal-tar benzene by treatment with concentrated acid, with which it forms an acid-soluble sulphonic acid much more readily than with the aromatic hydrocarbons, sulphuric acid has been used extensively for the removal of this compound and its derivatives from benzoles. In general, it has been concluded that the thiophen is more readily removed the higher the concentration of the acid. Thus, Ellerton [13] stated that the proportion of thiophen removed from crude benzole depended entirely on the strength of the acid, and that only the strongest acid has any appreciable action. Evans and Hollings,[14] however, have claimed that thiophen and its derivatives can be removed from benzoles by treating them at a temperature between 30 and 90° C. with 60 to 85% sulphuric acid, or alternatively by passing the vapours through 73 to 82% acid.

More recently, Wood and others [15, 16] have investigated the action of sulpuric acid (sp. gr. 1·84) on thiophen dissolved in sulphur-free naphtha, and found that the sulphur was removed in increasing amounts according to the quantity of acid used, but that not until the quantity of acid used had been increased to 12% by volume was the thiophen practically completely removed. They found that sulphides were also soluble in concentrated acid, and to a less extent disulphides. The desulphurizing action of the acid on these sulphur compounds decreased as the strength of the acid was lowered. Mercaptans were oxidized to disulphides and removed as such, and hydrogen sulphide was oxidized to free sulphur. Free sulphur and carbon disulphide were not affected by sulphuric acid of any strength.

Most of these publications deal with the removal of thiophen and other sulphur compounds from coal-tar or petroleum fractions that apparently were practically free from unsaturated hydrocarbons, and only recently have any investigations been reported that are of interest in connection with the problem of the removal of thiophen from crude motor fuels without destroying the unsaturated hydrocarbons. The presence of cyclo-pentadiene, *n*-hexylene, and *n*-heptylene, &c., in crude benzole has been established by Kruber,[3] who found that in refining benzole with sulphuric acid, part of the thiophen condenses with certain of these unsaturated hydrocarbons to form products that appear as high-boiling liquids or as water-soluble gums. Kopelevitsch, Brodovitsch, and Hecht[17] have recently suggested the addition of a light oil containing cyclopentadiene to benzole before washing with acid, in order to assist the removal of thiophen. Details published by Halloran[18] of a cold-treating process for cracked naphthas may also be mentioned in this connection. The principle of this process is that at low temperatures strong sulphuric acid retains its activity as a solvent for certain types of sulphur compounds, but is much less active at these temperatures as a polymerizing and sulphonating agent. Halloran, however, gives no information concerning the type of sulphur compounds that are removed from the Californian cracked naphtha he treated by his process.

The experimental work described below was undertaken in order to discover the best method of using sulphuric acid to bring about a selective removal of the objectionable constituents of crude benzoles, such as pyridine and sulphur compounds, with at the same time the minimum destruction of the unsaturated hydrocarbons which if necessary can be stablilized by the use of inhibitors.

V. Experimental.

(A) Removal of Pyridine Bases.

It has long been known that pyridine bases can be removed by washing benzoles with sulphuric acid, and it has generally been assumed that treatment with 95-98% sulphuric acid removed these basic compounds completely, although it is doubtful whether this was always effected, as confirmed by the following investigation.

Determination of Pyridine Bases.

For this investigation, it was necessary to have a method of determining small quantities of pyridine bases in benzoles with a reasonable degree of accuracy. Of the large number of methods that have been proposed for the detection and estimation of these compounds, the colour reaction between pyridine, cyanogen bromide, and aniline[19] appeared to be the most suitable for our purpose. In carrying out the test, 5 ml. of freshly prepared cyanogen bromide solution, prepared by mixing equal volumes of bromine water and 5% potassium cyanide solution, was shaken with the benzole and a few drops of aniline, and the time taken to reach an arbitrary colour standard was noted. From the times taken for benzole solutions containing known amounts of pyridine to reach the standard colour in the test, a fairly close approximation of the pyridine content of the sample under test was obtained. The results were checked by shaking the sample with neutral carbon dioxide free water, to which a mixed indicator was added. By comparing the colour of the indicator with that produced by known solutions of pyridine in benzene, an estimate of the pyridine content was obtained.

Method of Carrying Out Experiments on the Removal of Pyridine Bases from Benzoles.

A once-run coke-oven benzole was used from which the phenols and pyridine bases had been completely removed by washing repeatedly with dilute alkali and acid. To this benzole, known amounts of pyridine bases were added. The pyridine bases consisted of a fraction obtained from crude pyridine by distilling over a 6-bulb Young column to 200° C.

The treatment with sulphuric acid of the samples of benzole prepared in this way was carried out as follows. The benzole (200 ml.), filtered if necessary to remove traces of separated water, was placed in a small rotary washer and the acid added. The benzole and acid were brought into intimate contact for half an hour, allowed to settle for a similar period, and the acid run off. The benzole was then washed with water and with alkali. Finally, the benzole was distilled over a 6-bulb Young column to 160° C.* and the distillate was shaken with dry sodium carbonate and washed with water to ensure freedom from sulphur dioxide. After filtering through a dry filter paper, the distillate was tested for pyridine bases by the methods detailed above.

(1) *Effect of the Quantity and Strength of Sulphuric Acid.*

In each test, 200 ml. of the benzole to which 0·5% by volume of pyridine bases had been added was treated as described above with 2 or 4% by volume of acid of different strengths. A 2-minute wash with about 5% by volume of water was given after the acid had been separated, followed by 15 minutes for settling before washing with alkali. Examination of the final distillates for pyridine bases gave the results given in Table I.

TABLE I.

Test.	Strength of Acid (% by Wt.).	Quantity of Acid (% by Vol.).	Pyridine Content of Final Distillate (% by Vol.).
A	20	2	0·001
B	20	4	0·001
C	50	2	0·001
D	50	4	0·001
E	78	2	0·0015
F	78	4	0·001
G	87	2	0·007
H	87	4	0·003
I	98	2	0·020

Comparing the results obtained when using 2% by volume of acid, it will be seen that the pyridine bases were most completely removed with acid of 50% strength or lower, the efficiency of removal decreasing as the strength of acid was increased above this strength. With 4% by volume of acid, removal of pyridine bases was more complete, but the efficiency of removal was least with the highest strength of acid used.

(2) *Effect of the Subsequent Water Wash.*

The completeness of the removal of the acid from the benzole obviously governs to a large extent the efficiency of the removal of pyridine bases, because the bases contained in this acid will be returned to the benzole on subsequently neutralizing with alkali. Further, the smaller the volume of acid used, the more important it is to obtain

[12] Meyer. Ber., 1882, **15**, 2,893; 1883, **16**, 1,465.

[13] Ellerton. J.S.C.I., 1912, **31**, 10.

[14] B.P. 152,470, 1919.

[15] Wood, Lowy, and Faragher. Ind. Eng. Chem., 1924, **16**, 1,116.

[16] Wood, Sheely, and Trusty. Ind. Eng. Chem., 1926, **18**, 169.

[17] Kopelevitsch, Brodovitsch, and Hecht. Koks i Chem., 1935, No. 7, 19; B.C.A., 1935, B1,081.

[18] Halloran. World Petrol. Congress, 1933, **2**, 3; Standard Oil Co. of Calif. and Davis and Hampton, U.S.P. 1,869,885, 1927.

[19] König. J. Pr. Chem., 1904, **70**, 19; Lehner, Chem.-Ztg., 1922, **46**, 877; Goris and Larsonneau, Bull. Sci. Pharmacol., 1921, **28**, 497; Chem. Abstr., 1922, **16**, 886; Tallantyre, J.S.C.I., 1930, **49**, 466T; Kulikow and Krestowosdwigenskaya, Z. Anal. Chem., 1930, **79**, 452.

* In this and all subsequent experiments the treated benzole was redistilled through a 6-bulb Young column to 160° C., since the distillate thus obtained corresponds closely with the N.B.A. Specification for distillation range.

complete separation. When using a given quantity of acid, the amount of pyridine bases left in the benzole will depend also on the completeness of separation of the water used in the subsequent water wash. Since it was considered probable, therefore, that the decreased efficiency of removal of pyridine bases when using acid of high strength was due to the greater difficulty under these conditions of freeing the benzole completely from acid-tar, further tests were carried out in which the benzole was treated with 2% by volume of 98% by weight acid, and the method of subsequently washing with water was varied. In some of these tests the benzole, after running off the water, was treated with anhydrous sodium sulphate and then filtered through a dry filter paper in an attempt to obtain a further separation of suspended acid-water containing pyridine sulphate.

TABLE II.

Test.	Type of Water-Wash.	Pyridine Content After Treatment (% by Vol.).
A	2 mins. wash, with 5% water; 15 mins. settling	0·028
B	2 mins. wash, with 5% water, followed by running off water, shaking benzole with anhydrous Na SO_4 and filtering before neutralizing with alkali	0·009
C	Water spray only, no stirring	0·007
D	Wash with 1% of water for 2 mins., then 15 mins. settling, then shaking with Na_2SO_4, &c., as in B	0·011
E	Similar to D, but with 10% of water . . .	0·019

Test A was carried out exactly in the same way as Test 1 (Table I.). In Tests B, D, and E, in which the water was separated more completely by means of anhydrous sodium sulphate, the amount of pyridine bases left in the benzole was reduced to less than half the amount remaining in Test A. The smallest amount of pyridine bases was left in the benzole in Test C, in which the water was merely sprayed round the sides of the washer, possibly due to the fact that practically no water was left in suspension in the benzole in this test.

Further experiments, in which crude tar-acids in amounts up to 3% as well as pyridine bases were added to the benzole, showed that in these concentrations the phenols did not interfere with the removal of the pyridine to any measurable extent.

The effect of the presence of pyridine bases on the removal of colour is shown in Table III., the amount of colour removed and the decrease in yield of the final product on treating a benzole with 2% by volume of acid of 77 and 71% strengths varying inversely with the quantity of pyridine bases present. When comparatively high amounts of these bases were present, the acid had little effect on either the coloured or the unsaturated constituents.

TABLE III.—*Effect of Pyridine Bases on Removal of Colour and Thiophen Sulphur.*

Benzole-Coke Oven.

Pyridine Bases (% by Vol.).	Yield (% by Vol.).	Colour* of Fraction.	Total Sulphur (% by Wt.).	Sulphur as CS_2 (% by Wt.).	Sulphur as Thiophen (% by Wt.).	Sulphur as Thiophen Removed (% by Wt.).
Distilled only—no pyridine	95·0	10 G	0·96	0·44	0·52	..
Washed with 2% by Vol. B.O.V. (77% strength).						
0·0	91·0	−1 Y	0·80	0·45	0·35	0·17
0·2	91·5	−1 Y	0·77	0·42	0·35	0·17
0·5	92·5	−1 Y	0·86	0·42	0·44	0·08
1·0	93·0	4 Y	0·93	0·43	0·50	0·02
1·5	..	6 G	0·93	0·42	0·51	0·01
Washed with 2% by Vol. of 71% H_2SO_4.						
0·0	92·0	−1 Y	0·89	0·44	0·45	0·07
0·2	93·0	−1 Y	0·91	0·44	0·47	0·05
0·5	93·0	5 Y	0·94	0·44	0·50	0·02
1·0	93·0	7 Y	0·97	0·44	0·53	0·0

* The colour standards were as follows:—

10 G = 5 ml. of N/10 $K_2Cr_2O_7$ diluted to 500 ml. with distilled water.
10 Y = 5 ml. of N/10 $K_2Cr_2O_7$ + 12·5 ml. of N/10 $CoSO_4$ diluted to 500 ml. with distilled water.

The 1, 2, 3, 4.....&c., colour standards were prepared by diluting 5, 10, 15, 20.....&c., ml. of the 10 G and 10 Y solutions to 50 ml. Comparison was made with an equal volume of the benzole sample in similar Nessler tubes.

These results show that when large quantities of pyridine are present, the small quantities of acid employed in modern processes may be neutralized by the pyridine before the desired effects, such as removal of colour, have taken place.

(*To be concluded.*)

Gas Undertakings' Results

Bridgwater.

The Directors' report on the Bridgwater Gas Light Company for the year ended Dec. 31, 1935, states that there has again been a gratifying increase in the sales of gas and gas-consuming appliances. The accounts show that after payment of income-tax, debenture interest, interim dividends, &c., and carrying £543 to the renewal fund and £300 to the special purpose fund, there is a balance of £8,783 which can now be dealt with. The Directors recommend the payment on April 1 of a final dividend of 4%, less tax, making 7½% for the year. From the balance available they recommend that £90 be carried to the reserve fund, and the remaining balance carried forward to the next year's accounts.

Dartmouth.

The Directors of the Dartmouth Gas, Coke, and Coal Company report that for the year ended Dec. 31 last the profit on the year's working (after charging to revenue all renewals, repairs and maintenance, and depreciation on meters and gasholders) is £2,189. After charging £280 interest on mortgage debentures and £84 interest on the first preference shares, and £83 for income-tax, there remains a balance available for distribution of £1,953. The Directors recommend the payment, less income-tax, of the full dividend of 6% on the second preference shares, absorbing £312, and a dividend of 10% on the ordinary shares, absorbing £1,254, and purpose carrying the sum of £140 to the general reserve fund account, leaving a balance to be carried to the next account of £247.

Prescot (United Kingdom).

The report of the Directors of the Prescot and District Gas Company for the year ended Dec. 31, 1935, states that the amount available for dividend is £6,394. In addition to the interim dividend (subject to income-tax) for the half-year ended June 1 last, and paid on Sept. 1, the Directors recommend that the following dividends (also subject to income-tax) for the half-year ended Dec. 31, 1935, be declared at the following rates per annum—viz., on £4,510 preference "C" stock 4%, on £8,420 preference "C" stock 4½%, on £3,070 preference "C" stock 5%, on 17,000 consolidated ordinary shares 5%, on £7,500 preference "C" stock, 1935, 4½%, on £18,100 preference shares 6%, amounting to £3,024. This will leave to the credit of the revenue account £3,370. During the past year an offer was received from the United Kingdom Gas Corporation, Ltd., to purchase from the shareholders their holdings of ordinary shares in this Company, and as the offer was accepted by shareholders holding about 94% of those shares, the sale was approved upon the terms submitted. The Chairman, Mr. F. V. Driffield, who had acted as a Director for 28 years, and Mr. R. H. Whitaker retired from office and Colonel W. M. Carr and Mr. M. H. Tetley were elected to the vacancies.

Primitiva (Buenos Aires).

The report of the Directors of the Primitiva Gas Company of Buenos Aires for the year ended Dec. 31, 1935, states that the balance of revenue account converted at par of exchange amounts to £410,916, and after providing for the various charges detailed in the profit and loss account, there remains a balance of £159,304. To this is added the balance brought forward from 1934, £59,712. The Directors propose to allocate this to: Depreciation and renewals reserve, £80,000, contingencies reserve, £10,000, making £90,000, and recommend a dividend of 2% free of income-tax absorbing £59,989, leaving to be carried forward the sum of £69,027. Currency revenue has been maintained, but sterling profits have again been adversely affected by the depreciation of the Argentine peso.

Wisbech.

The report of the Directors of the Wisbech Gas Company for the past half-year revealed a substantial increase in the consumption of gas, and there was a satisfactory net profit of £5,056. The credit balance of the profit and loss account was £12,018, and dividends at the following rates were declared: Ordinary stock (£3 certificates), 12% per annum, less income-tax; ordinary £5 shares, 11% per annum, less income-tax.

LOCAL ASPECTS OF
Town Gas Service

by
R. D. KEILLOR,
Engineer & Manager of the Greenock Gas Department

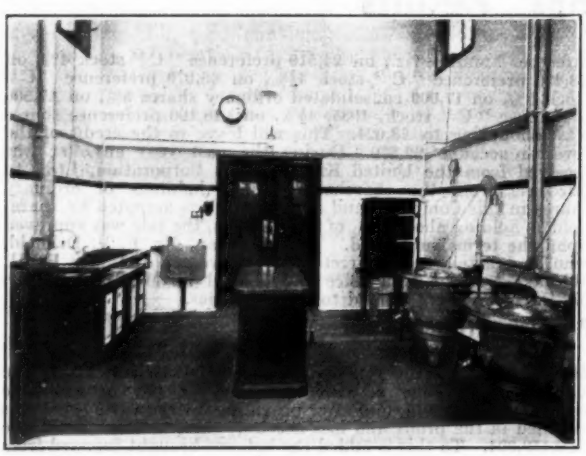
A Paper presented at the Spring Meeting of the North British Association of Gas Managers held in Glasgow on April 3, under the Presidency of Mr. JAMES DICKSON, of Kirkintilloch.

One of the principal objects of the North British Association of Gas Managers is to provide facilities for constructive discussions calculated to further improve the valuable public service presently rendered by the Gas Industry. My task on this occasion is to open up lines of thought on the distribution and selling side of our business; most of the lines which I introduce are probably not new, but I hope to present these lines in such a way that a useful discussion will be provoked.

Greenock became a " Burgh of Barony " in 1635, and the Burgh boundaries now enclose an area of 3,176 acres. Owing to the hilly nature of the hinterland the older building sites were quite naturally concentrated along the North boundary of the Burgh which is, of course, the Firth of Clyde. The original gas-works was built in 1828 close to the waterside and to all intents and purposes in the centre of " old " Greenock. As the population of the Burgh increased, extensive building took place on the hillside until to-day, with a population of approximately 80,000, the building strip reaches some 2 miles inland from the northern boundary; the valuation of the Burgh (including railways) is now in the neighbourhood of £700,000.

Owing to the rapidly expanding market for gas it was necessary to find a much larger site for gas-works and in the year 1873 a new works was established at Inchgreen near to the Eastern boundary of the Burgh. It is therefore necessary to send gas a distance of approximately 4 miles to supply the West end of the Burgh. An 8-in. steel high-pressure trunk main (provided with branch feeders) from Inchgreen to the Western boundary is employed to boost the pressure in the most distant and most thickly populated areas of the Burgh.

In the past, arrangements were made to control the pressure in the upper or Southern districts during times of reduced demand by restricting the flow of gas in the low-pressure mains feeding those districts; now it is found more suitable to work without such restricting media and it has even been necessary to lead additional high-pressure branch mains to the Southern districts from the 8-in. high-pressure trunk main. Excessive pressure can now be conveniently obviated in the upper districts by the systematic regulation of pressures in the high-pressure network.



Kitchen, Larkfield Auxiliary Hospital; catering for 65 persons.
This hospital uses 1¼ million cu.ft. of gas per annum.

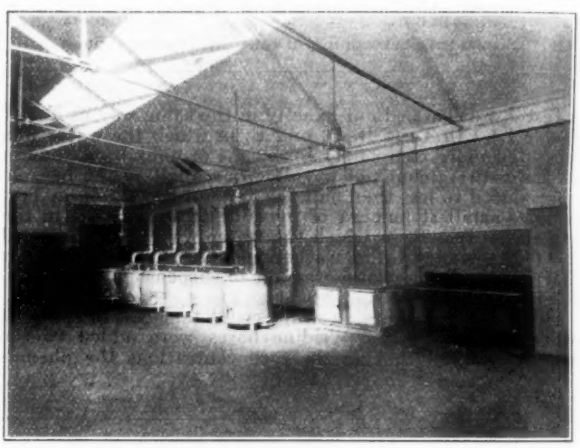
Gas Mains.

It is a wise policy to be continually conscious of the age of the existing underground works of the gas undertaking. Even if underground works such as main pipes and service pipes are in comparatively new condition they will sooner or later require to be overhauled and it would appear to be more prudent to overtake such important work year by year in accordance with a predetermined plan rather than to wait until emergencies arise and wholesale renewals become necessary.

In Greenock approximately two miles of mains, varying in size from 12 in. to 4 in. diameter, have been laid each year for the past five years; in the same period about a mile of 2-in. and 3-in. mains has been replaced. At May 15, 1935, the mileage of mains in Greenock was 91·27; only 6% of the total mileage is less than 3 in. diameter.

Anticipating Future Demands for Gas.

While the routine renewal and replacement of the gas mains in Greenock proceed steadily, plans have also been prepared for new trunk mains capable of carrying the increased load anticipated in future years. Referring to the pressure and output diagrams (Appendices A—I. and II.) it is obvious that a rather high pressure is presently necessary in the low-pressure trunk main at the station governor outlet in order to maintain a reasonable pressure in the central and outlying districts. A separately governed 18-in. low-pressure trunk main is therefore to be laid from the works to supply the Eastern area presently supplied from the 24-in. low-pressure trunk main. The first stage of this job was undertaken three years ago when an extensive road-widening scheme was carried out by the Corporation; 1,000 yards of the new trunk main were then laid. The second stage of this job entails the laying of a further 400 yards and will be carried out this year. It is intended that the existing 24-in. trunk main will ultimately be relieved of all tappings in the East end of the Burgh; it will then be possible to employ a much higher pressure at the works end of the 24-in. main without affecting East end " house " pressures.

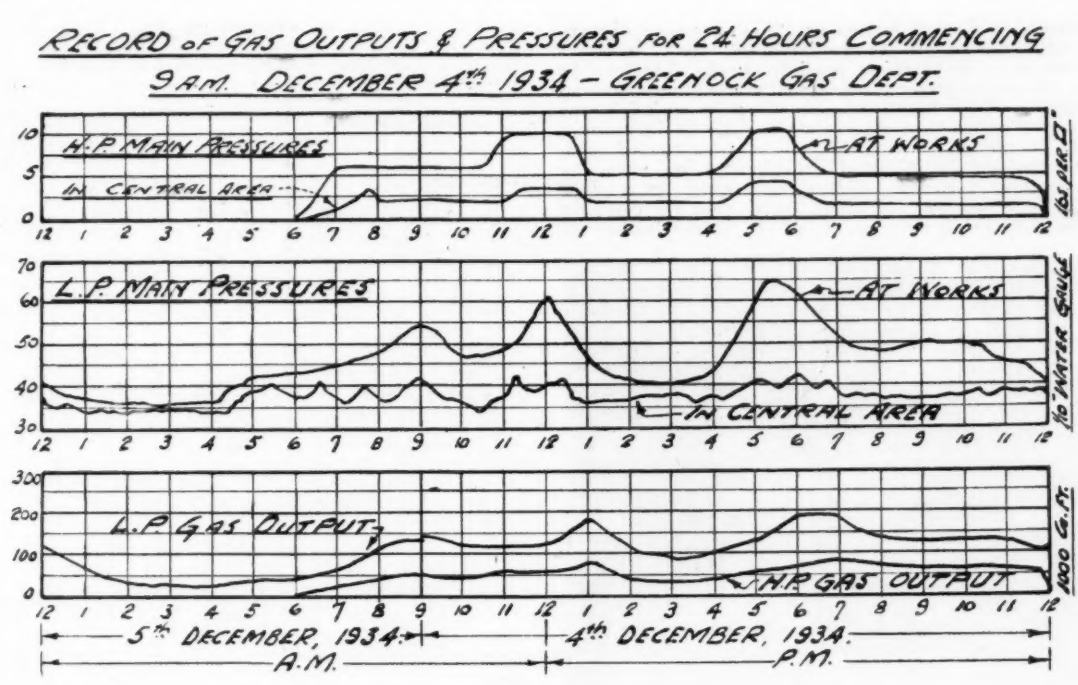


Kitchen, Gateside Prison; catering for 200 persons.

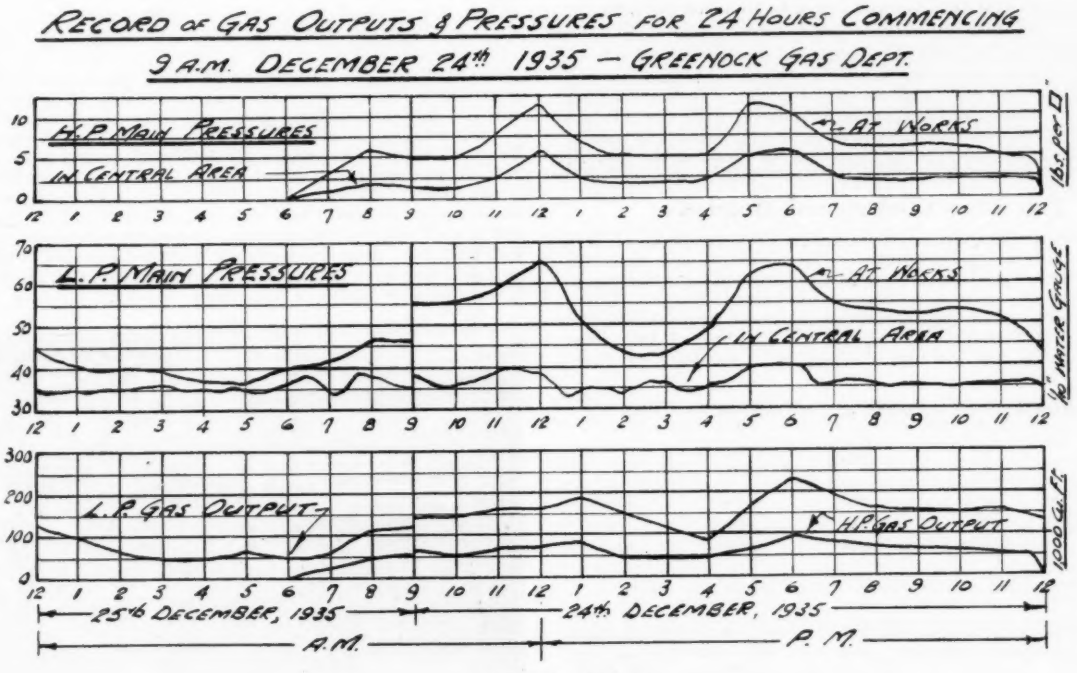
Unfortunately the existing 24-in. trunk main terminates in the middle of one of Greenock's busiest thoroughfares where it is connected to a 15-in. main which originally led gas in the opposite direction from the old gas-works. The end of the 24-in. main, however, happens to coincide with the locus of an extensive slum-clearance and rebuilding scheme; the scheme referred to is now proceeding and it is proposed to carry 450 yards of 18-in. main from the tail of the 24-in. main through the heart of the new scheme where modern shops, offices, and houses are to take the place of old slum properties.

District Pressure Regulation.

In the 1920 Gas Regulation Act a minimum pressure of 2½ in. water column in supply mains was specified but the ideal worked to in Greenock is a satisfactory minimum pressure *at the inlet to each consumer's meter.* The com-



Appendix A—I.



Appendix A—II.

posite diagrams already referred to (Appendices A—I. and II.) show the actual pressure variations found necessary at Inchgreen Gas-Works during the winters of 1934 and 1935 respectively in order to maintain a steady and satisfactory minimum pressure throughout the district; the total volume of gas sent out per hour is also shown in these diagrams together with the estimated proportion of gas delivered through the high-pressure network.

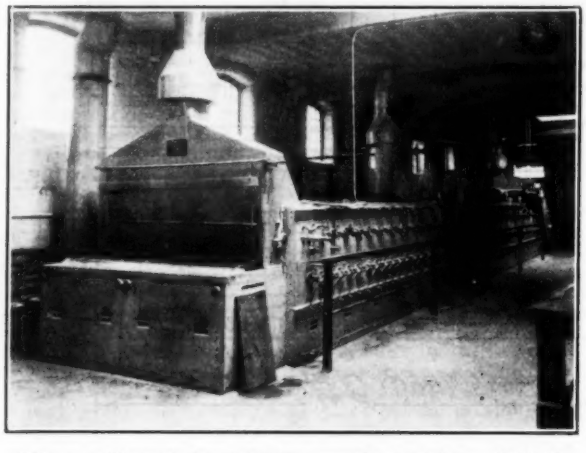
Services.

While renewing gas mains in Greenock it was soon realized that a satisfactory minimum pressure could never be maintained at the inlet to consumers' meters unless the intervening services were also thoroughly overhauled. It was argued that although our duty in respect of pressure maintenance terminated outside consumers' premises the expenditure involved in gas main renewals would not materially benefit consumers unless the necessary service renewals be undertaken concurrently; for many years now in Greenock the service-layer has shadowed the main-layer. A low " unaccounted-for gas " figure and freedom from accidents are two very desirable objectives which may in themselves prove adequate recompense for expenditure incurred, renewing mains and service pipes where necessary. To deliver goods by dumping them outside consumers' premises, expecting the buyer to be responsible for the goods thereafter, is not in line with modern ideas of service; inadequate services must certainly have an adverse effect upon gas and gas appliance sales in many districts, especially where tenement properties abound.

Consumers' Meters.

Let us keep in mind that even if we do make profits in the retort house there is no reason why we should dissipate those profits by giving " overweight " through inaccurate meters. So far as the performance of gas meters is concerned it is well to remember that, although consumers may suspect " slow " or otherwise unsatisfactory meters, the gas engineer's best safeguard against inaccurate measurement and other common meter troubles is surely the positive testing of meters at regular intervals. Even the best of meters must eventually suffer from neglect and

may develop a disease known as "high-pressure absorption;" neglected meters are also liable to "stick" without much warning. Everything possible should therefore be done to anticipate meter failures and to avoid aggravating interruptions of gas supply brought about by such failures. It is good practice to regularly replace a certain number of meters each year according to a prearranged programme (preferably adjusted in collaboration with the meter reading section). Before arranging to replace meters it is, of course, important to see that the capacity of each meter fitted is in excess of the actual loading of



60-ft. travelling-sole bread baking oven in the bakery of W. G. McAulay, Ltd.; bakes 112 dozen Scotch square loaves per hour.

the installation concerned; additional appliances may have been installed since the last survey carried out by the maintenance section, and the overloading of a meter must be strictly avoided. A statement dealing with the various types of meters in use in Greenock is appended (Appendix B) together with a typical summary of meter tests carried out on meters as removed from the district.

Free Loan Cookers and Hotplates.

Gas Service in Greenock includes the provision of free cookers and range hotplates. The cookers are now all fitted with a specially designed standardized top; the range hotplates are also of special standardized design. There is no doubt as to the popularity of these appliances—the following statement relating to the number of free loan appliances in use on the district is a measure of their popularity:

Statement Showing Number of Appliances on Free Loan.

Year.	Cookers.	Hotplates.	Miscellaneous Appliances.	Total.
1920 . . .	4,632	3,263	7,764	15,659
1925 . . .	5,332	4,336	6,777	16,445
1930 . . .	5,716	6,185	6,809	18,710
1935 . . .	6,462	7,405	6,186	20 053

NOTE.—The population of the Burgh was 81,120 in 1921 and is now 79,6 0.

All free loan appliances are cleaned, overhauled, and renovated when necessary, and some 800 cookers and hotplates pass through the renovating department each year. The fitting of the specially designed standard cooker tops and the substitution of new range-plates for old was commenced in 1924 and was successfully carried out without increasing the staff in the renovating department.

Maintenance of Gas Appliances.

Notwithstanding the apparent beauty or efficiency of gas appliances their ultimate popularity depends upon the service they are capable of giving under actual working conditions. To ensure that gas appliances will give continuous trouble-free service it has been found advisable in Greenock to regularly inspect all appliances on the district; any minor defects or maladjustments are attended to without cost to the consumer. This course was adopted 14 years ago and in addition to the improved service thereby made possible we have profited greatly from information gained during these periodical maintenance visits. The cost of this scheme works out at approximately ½d. per 1,000 cu.ft. (0·12d. per therm) of gas sold.

Showrooms and Sales.

Greenock Gas Department has boasted a spacious gas showroom since 1913; in this connection Mr. James McLeod

APPENDIX B.

Statistics Relating to Meters in Use, &c.

Type and Size of Meter.	Number in Use.	Percentage of Total.	Number of Slot Meters Included.
Lights type—			
2 light.	477	2·4	—
3 ,, ...	10,136	52·1	7,636
5 ,, ...	2,270	11·7	350
10 ,, ...	749	3·8	—
Over 10 ,, ...	284	1·5	—
Standard type			
No. 2	4,659	23·9	3,842
No. 3	638	3·3	202
No. 4 and over	27	0·7	—
High capacity type—			
125 cu.ft. per hour and under	29	0·6	17
250 cu.ft. per hour . . .	56		6
450 cu.ft. per hour and over	29		—
Total	19,454	100·0	12,059

Summary of Ordinary Meter Tests.

Result of Test.	Monthly Return.		Progressive Return.	
	Number Tested.	Proportion of Total Tested.	Number Teste .	Proportion of Total Tested.
		%		%
Within statutory allowance .	44	86	282	66
Fast	1	2	33	8
Slow	4	8	83	19
Not registering	2	4	31	7
	51	100	429	100

(who was the Gas Engineer at that time) is to be congratulated for his foresight. It is possible to trace a substantial increase in local gas sales since the opening of the —what must then have been "luxurious"—showroom; the Progress Chart (Appendix C) shows an increase of almost 70% in the annual make of gas in Greenock since 1914.

All usual modern sales methods are operated from the showroom; the show and demonstration facilities provided are greatly appreciated and are taken advantage of extensively by our customers. Last year, for example, 20,143 calls were made by consumers at the showroom. Gas appliance sales in Greenock are not by any means

45-ft. two-grid conveyor oven, also in W. G. McAulay's Bakery.

These ovens together put through 90 tons of flour per week. This bakery uses 15 million cu.ft. of gas per annum.

spectacular nowadays but there has recently been an improvement in the previously fairly consistent demand for new appliances. The value of gas appliances sold each year since 1923 is shown diagrammatically (Appendix D); as matters of parallel importance gas sales per consumer and the average price of gas in Greenock for the same period are also given (Appendix E).

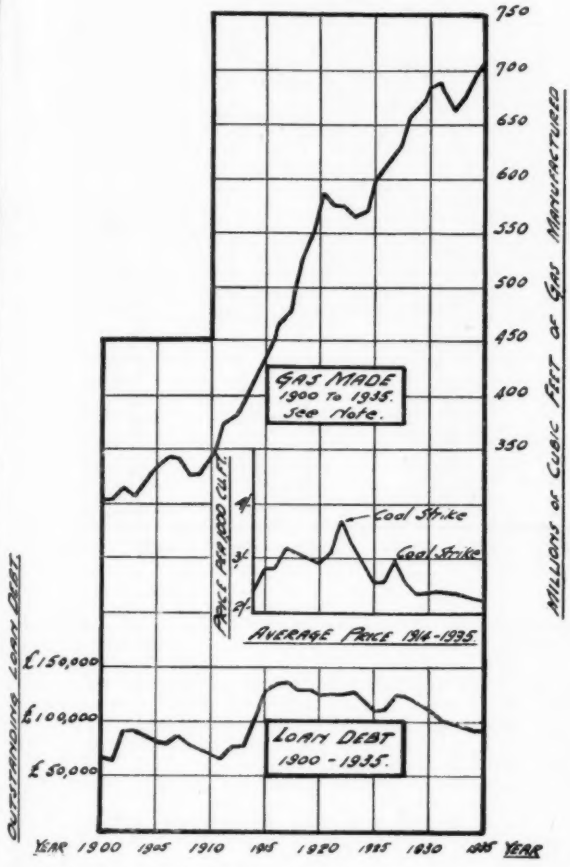
Analysis of Gas Sales.

The success, or otherwise, of efforts directed toward the promotion of gas sales in different spheres can be clearly followed when a standardized system of analysing is adopted. As a matter of interest in this connection a

GREENOCK CORPORATION GAS DEPARTMENT.

PROGRESS CHART

Showing Quantity of Gas Manufactured, Average Selling Price, and Outstanding Loan Debt.


GAS MADE 1900 TO 1935. See Note.
Coal Strike
Coal Strike
AVERAGE PRICE 1914-1935
LOAN DEBT 1900 - 1935.
MILLIONS OF CUBIC FEET OF GAS MANUFACTURED
OUTSTANDING LOAN DEBT
PRICE PER 1000 CU.FT.
YEAR 1900 1905 1910 1915 1920 1925 1930 1935 YEAR

NOTE.—The manufacture of gas has been continuous since the year 1828.

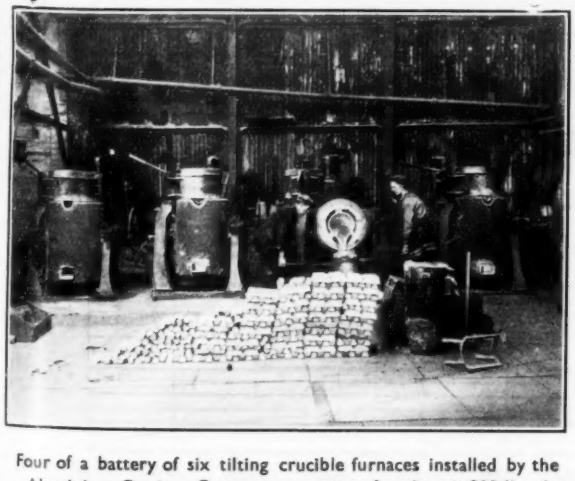
Appendix C.

classified analysis of gas sales in Greenock for the year 1934-35 is appended (Appendix F).

The following statement shows the interpretations which are applied to the "Commercial" and "Industrial" classifications respectively:

Consumers classified as "Commercial."

(*a*) Restaurateurs and "home" bakers.
(*b*) Shopkeepers and proprietors of business offices.
(*c*) Schools and institutions.



Four of a battery of six tilting crucible furnaces installed by the Aluminium Castings Company; capacity of each unit 200 lb. of aluminium.

This Company used 11 million cu.ft. of gas last year.

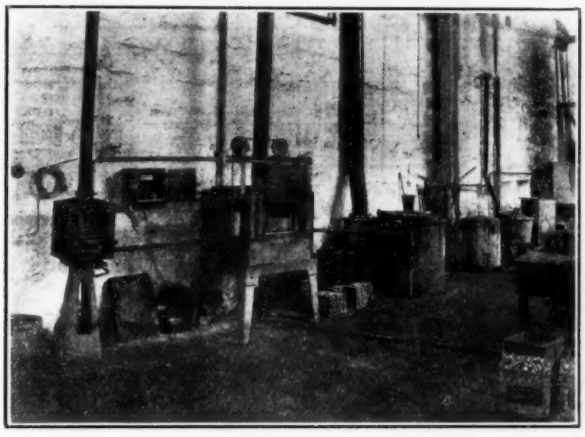
Consumers classified as "Industrial."

(*d*) Wholesale bakers.
(*e*) Makers of castings.
(*f*) Shipbuilders, engineers, boilermakers, and other manufacturers.

In the files of the meter reading section "Commercial" and "Industrial" consumers' survey cards are distinctively marked to facilitate the ready analysis of gas sales.

Gas Charges.

A "sliding scale" of gas charges, for gas used through ordinary meters, was adopted in Greenock in 1920. This system of charging was selected because it appeared to be best suited to local conditions; with modifications the scale has now been in operation for 15 years and has proved to be of great assistance in widening the scope of gas service. The extent of the modifications applied to the original scale of charges is given (Appendix G) where a comparison is drawn between the original scale and the modified scale operating to-day.



Furnaces recently installed by Scott & Co., Ltd., in the blading shop of their marine engineering works.

On the left are annealing furnaces (note temperature indicator); next is a brass melting crucible furnace; next are caustic soda and water boilers respectively. On the extreme right is a degreasing unit beside which are borax and acid pans. Scott & Co., Ltd., now use approximately 1 million cu.ft. of gas per annum.

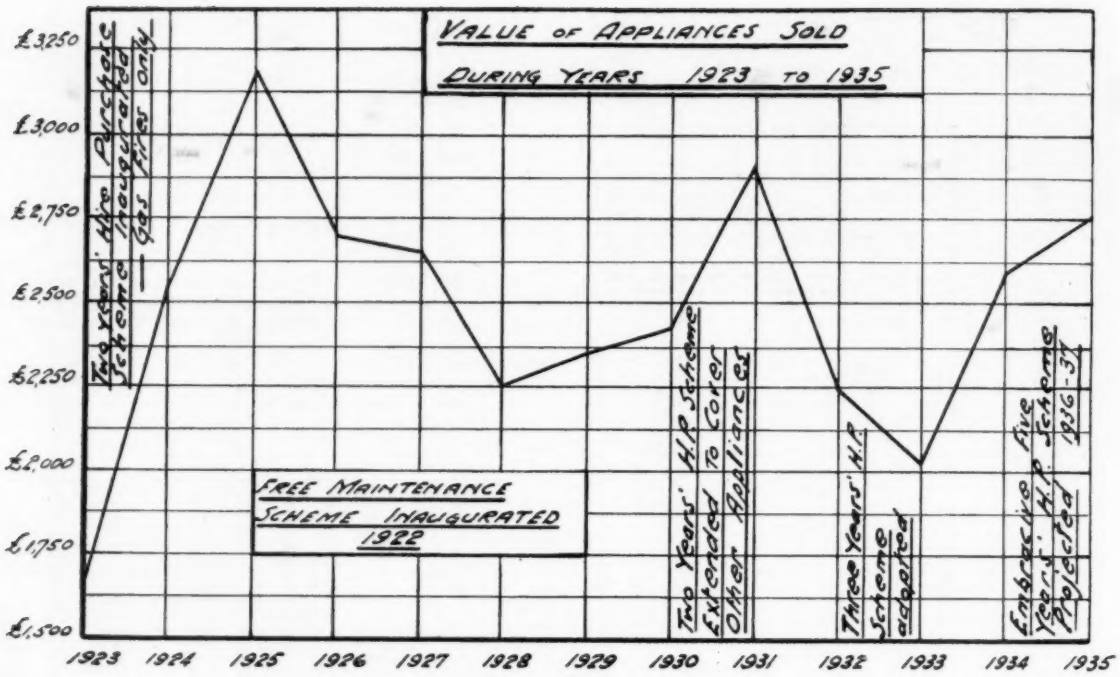
The question of introducing multi-part tariffs has been seriously considered but the existing scale is so firmly established and so well suited to local conditions that it does not appear desirable to introduce any other system of charging in the meantime. A statement has, however, been prepared with a view to determining what service charges would probably require to be collected from each class of consumer in Greenock if the two-part tariff system of charging were adopted (Appendix H).

Owing to the unfortunate state of the coal mining industry it is most unlikely that general reductions in gas charges can be expected for some years; the general tendency will probably be toward higher prices. In this connection it is gratifying to find that the politician now recognizes "cheap gaseous fuel for industry" to be an important National asset (if recent interest in coke oven gas "grids" is any criterion). In view of this new interest and in order to offset the effect of rising coal prices on the cost of gas to industry we should be within our rights in pressing for an extension of rating relief to the Gas Industry. Although it is not generally known, gas charges include a proportion of the cost of maintaining certain public services which have absolutely no connection with the production and distribution of town gas; other industries have obtained relief in respect of such unreasonable burdens and a determined effort should now be made to finally rid gas undertakers of these iniquitous charges.

Research and Improved Gas Service.

There is no doubt that the design and finish of gas apparatus have been greatly improved in recent years; the collective effort expended in this direction must have been enormous. It would, however, be a fatal error to view the present position with complacency, and I may therefore be pardoned for the introduction here of a note of suggestive criticism respecting certain aspects of gas usage.

Let's start with gas lighting. I remember drawing at-

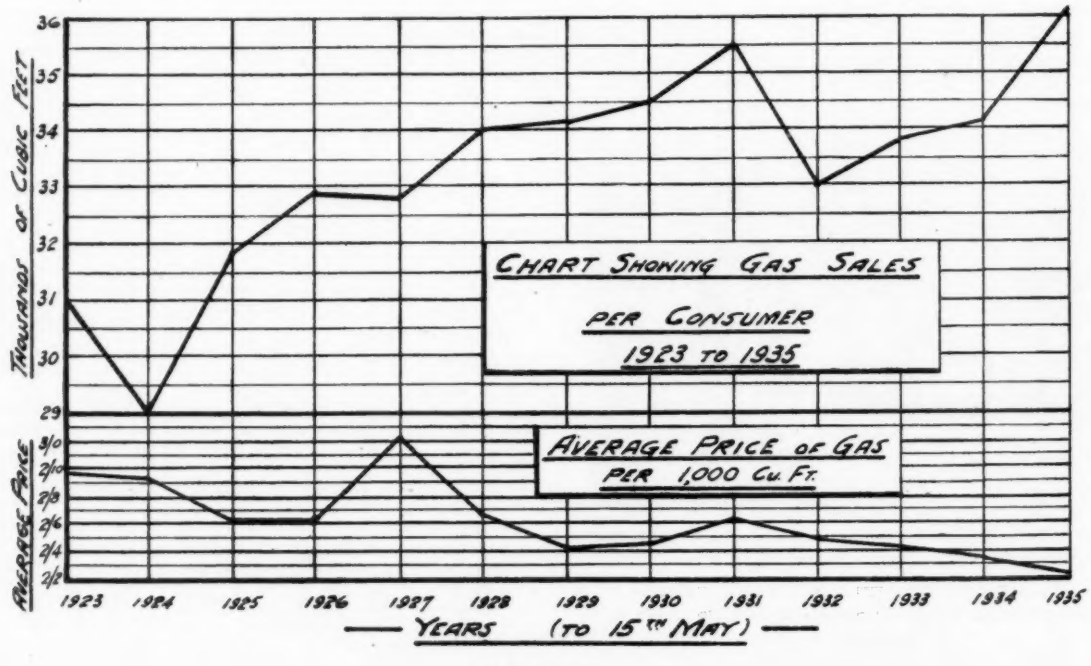

VALUE OF APPLIANCES SOLD
DURING YEARS 1923 TO 1935
£3,250
£3,000
£2,750
£2,500
£2,250
£2,000
£1,750
£1,500
Two years' Hire Purchase Scheme inaugurated — Gas Fires only
FREE MAINTENANCE SCHEME INAUGURATED 1922
Two years' H.P. Scheme Extended to cover Other Appliances
Three years' H.P. Scheme adopted
Embracing five years' H.P. Scheme Projected 1936-37
1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935

Appendix D.

tention to the low thermal efficiency of the gas-heated incandescent mantle in a Presidential Address to a Junior Association in 1929. Until the recent advent of the "Supervia" lamp nothing of a revolutionary nature in the gas lighting field was noted. Have we reached finality in gas lighting? Could not a much higher output of light be obtained from gas heat if money were devoted to research in this direction? Has the high-pressure impregnation of mantle fabrics during manufacture been tried? Are there any untried elements which would give enhanced light output with the same expenditure of heat energy? Only patient research will provide satisfactory answers to questions such as these (if they have not already been systematically considered).

Now let's consider radiant gas heating. We know that when radiant heat waves pass through the atmosphere the atmosphere is not appreciably warmed by their passing until the radiant heat waves are intercepted by solid objects and are thus converted into convected heat. Is not the *practical radiant efficiency* of, say, a gas fire dependent upon the number of objects intercepting the waves of radiant energy and the respective positions of these objects relative to the radiant heat source? To what distance, for instance, can waves of radiant heat be propagated from a given gas fire before the power to generate appreciable quantities of convected heat from intervening solid bodies is to all intents and purposes lost? Until these questions are properly investigated we must guard against the possibility of gas fires being fitted and so positioned in large rooms that their practical efficiency as space heaters (due to the absence of objects within the effective range of the radiant heat source) is extremely low. In this connection it is significant to note that the recently introduced suspension type radiant panel heaters must be fitted at a standard height (9 ft. 6 in. I believe) above floor level to ensure that they will function efficiently.

As a final note of criticism I wish to draw attention to the interminable maintenance work necessary to keep the restricted mixing chambers of many types of gas burners free from fluff and dust. It would appear to be desirable to construct gas burners in such a way that any foreign matter present in the primary air supply will be intercepted before getting beyond the reach of those who are totally unskilled in the art of dissecting gas-burning equip-



Appendix E.

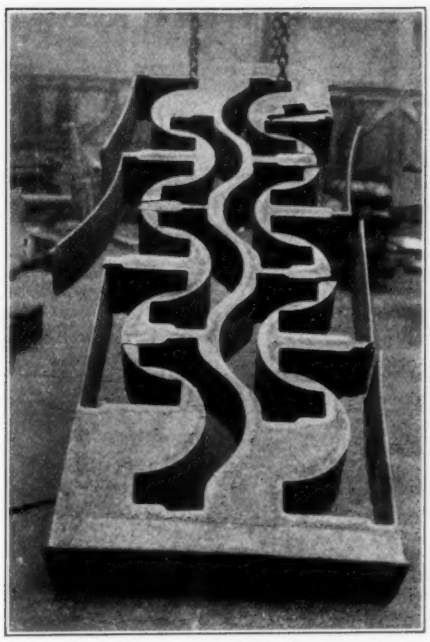
Oxy-coal gas precision cutting machine in operation in Messrs. J. G. Kincaid's Marine Engineering Works.

One of these machines was installed seven years ago; two are now regularly employed by Messrs. Kincaid and one by Messrs. Scott & Co. Messrs. Kincaid use approximately 6½ million cu.ft. of gas annually in their Marine Engineering Works and Boiler Shop.

ment. Apart altogether from the question of time expended cleaning and re-cleaning gas burners, the introduction of accessible—and successful—dust intercepters on gas equipment would greatly improve the utility of gas apparatus and would be a popular feature with gas consumers generally.

Similar lines of thought may be indulged in regarding other applications of town gas and all lines converge, pointing to well-directed research as the best way to accomplish future improvements in all branches of gas service with a minimum of expense and effort.

I do not mean to suggest that the work of scientists alone will provide the Gas Industry with every desirable improvement; on the contrary, I would instance two outstanding accomplishments of an old member of this Association who is a practical engineer and not a scientist. In the year 1888 he submitted a paper to this Association describing an ingenious installation of distance-controlled gas lighting incorporating an electric battery; the same engineer, I believe, invented the reversible grill burner



Illustrating how precision cutting by oxy-coal gas is employed to cut marine engine parts from billet.

A 13 in billet can be cut at the rate of 20 lineal ft. per hour. (Photo. by courtesy of the British Oxygen Company.)

for gas cookers in quite a casual way—the necessity of providing a new grill burner, with only malleable gas piping available for the purpose, was actually the mother of this invention. There is no doubt that science will play an increasingly important part in the future improvement of town gas service but we must remember that the full benefits of science can only be fully capitalized when practical engineers are continually on the alert and ever ready to volunteer suggestions through the medium of Associations—such as this North British Association of Gas Managers—as has been done in the past.

APPENDIX F.

Classified Details of Gas Sales and Gas Revenue.

Classification and Number of Consumers in each Class.	Therms Sold.	Percentage of Total Sales.	Revenue from Sale of Gas.	Percentage of Total Revenue from Gas.
			£ s. d.	
(1) Domestic sales—				
a. P.P. consumers . . . . . (12,059)	1,351,348·93	47·0	41,199 13 2	53·0
b. Ordinary consumers . . . . . (5,597)	657,743·32	23·0		
(2) Commercial sales . . . . . (1,363)	253,407·47	9·0	29,104 16 5	38·0
(3) Industrial sales . . . . . (109)	311,287·99	11·0		
(4) Public and private lighting. . . . . (7,278)	280,467·06	10·0	6,734 15 10	9·0
(Public . . . . 1,835)				
(Private court . . 360)				
(Stair lighting . . 5,083)				
(Total . . . 7,278)				
Totals	2,854,254·77	100·0	£77,039 5 5	100·0

APPENDIX G.

Gas Charges.—Comparison of Present Sliding Scale, &c. with Prices Ruling in 1922.

—	Present Price, Pence per Therm.	Price in 1922, Pence per Therm.	Reductions.	
			Pence per Therm.	Percentage on 1922 Price.
A. Prepayment consumers	7·317	10·49	2·973	28
B. Ordinary consumers (according to quarterly scale as follows):				
Up to 20·5 therms . .	7·25* Approx.	9·52†	3·27	34
Over 20·5 ,, 41·0 ,, . .	6·25 average,			
,, 41·0 ,, 102·5 ,, . .	6·00 6·25d.			
,, 102·5 ,, 307·5 ,, . .	5·50	8·78‡	2·53	29
,, 307·5 ,, 1,025·0 ,, . .	5·25	8·54	3·29	39
,, 1,025·0 ,, 2,050·0 ,, . .	5·00	8·05	3·05	38
,, 2,050·0 ,, 4,100·0 ,, . .	4·75	7·44	2·69	36
,, 4,100·0 ,, 8,200·0 ,, . .	4·25	7·08	2·83	40
,, 8,200·0 ,, 12,300·0 ,, . .	4·00	6·59	2·59	39
,, 12,300·0 therms	3·75	6·10	2·35	38

* Note.—These prices apply to all gas used through ordinary meters. † Domestic flat rate. ‡ Industrial scale.

APPENDIX H.

Statement dealing with the Possibilities of Employing Two-Part Tariffs in Greenock.

Classification.	Average Consumption per Consumer per Annum. Therms.	Present Average Rate per Therm.	Average Revenue per Consumer per Annum.	Service Charges necessary to Maintain present Revenue from Gas Sales with Commodity Price per Therm as under—					
				2d. per Therm.		3d. per Therm.		3½d.* per Therm.	
				Annual.	Quarterly.	Annual.	Quarterly.	Annual.	Quarterly.
		d	£ s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.
(1) Domestic sales—									
a. P.P. consumers . .	112·06	7·317	3 8 4	2 9 8	12 5	2 0 4	10 1	1 13 4	8 4
b. Ordinary consumers .	117·52	6·25	2 15 8	1 16 1	9 0	1 6 3	6 7	0 18 11	4 9
c. Average of *a* and *b* .	113·79	6·77	3 4 4	2 5 5	11 4	1 15 2	8 9	1 8 10	7 2
(2) Commercial sales . . .	185·92	6·00	4 9 4	2 18 4	14 7	2 2 10	10 8	1 11 2	7 10
(3) Industrial sales . . .	2,855·85	5·25	68 6 2	44 10 2	222 7	32 12 2	163 1	23 13 9	118 5

* Lowest price according to existing sliding scale.

Discussion.

Mr. J. JAMIESON (Edinburgh) said that by renewing pipes in Edinburgh where they had 10,000 services they had reduced their unaccounted-for gas by 50% and had also greatly lowered the cost of looking for escapes. A section of one of their 4-in. cast-iron mains had been examined at the Heriot-Watt College, Edinburgh, after eighty years' use and showed no deterioration. Mr. Jamieson said he appreciated the difficulties of controlling gas pressure in the outskirts of the city and suggested that it was time to consider the introduction of service governors. The charts supplied by makers of cookers were useless without governors. It was his experience that the greater part of the loss due to "slow" meters was confined to the small meters. Mr. Jamieson said that the two-part tariff system was not the solution to their problem of gas charging. In Edinburgh, they had a block system charging 6·9d. per therm and 5·7d. per therm after 5,000 cu.ft. If they introduced a two-part tariff system a service charge of 26s. per annum and a commodity price of 3·684d. per therm would be necessary to maintain the present revenue. In his opinion a multi-part tariff system was often used to hide a high price. He remarked that two young men in the Edinburgh Gas Lighting Department had devised a lamp which gave an efficiency twice that of present-day lamps. They had overcome the technical difficulties, and if they were able now to surmount the practical ones a very great advance in street lighting would be made.

Mr. J. WILSON (Dundee) said they were all faced with difficulties of distribution, especially where the area surrounding the works had become built up. It was difficult to increase the load carried by the trunk main and they were forced to adopt high-pressure distribution. This system might turn out to be advantageous, but it was true that they obtained a better levelling out of pressure in the low-pressure main, which was a benefit to the consumer. A good showroom was essential; they had a new showroom in Dundee and they now wondered how it had been possible to carry on with the old one. Although, as Mr. Jamieson stated, the cast-iron main might not deteriorate, there was the possibility of the main choking. They were re-servicing old property schemes in Dundee without charge to the consumer. He said they used the block system with success in Dundee, whereby the prepayment consumers also benefited although the initial rate was slightly higher. Their sales had increased by 30 million cu.ft. during last year, the increase being confined chiefly to the second and third steps of the scale.

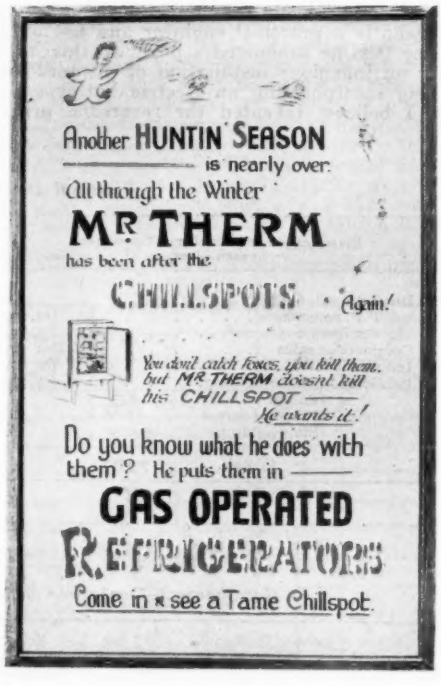
Mr. W. WILSON (Caledonian Gas Corporation) said it was their practice to test every meter at least once in every five years. During the war this testing lapsed and the unaccounted-for gas increased. There was not much leakage in the main, and on overhauling the meters they had reduced the unaccounted-for gas from 6% to 2%. Governors were desirable, and he mentioned a meter devised by Daniel McPhee which possessed an inherent governor. Regarding Mr. Keillor's reference to the work necessary to keep the mixing chamber of gas burners free from fluff and dirt, he said that they made very successful lighting installations in two Falkirk foundries. "Selas" lamps were used, and the air and gas were pre-mixed away from the dust.

Mr. A. S. NISBET (Paisley) said they had occasionally found that the supply of water in tenement buildings was insufficient for the successful operation of instantaneous water heaters and that in these cases it had to be increased. They also were increasing their gas servicing. He was very interested in the gas lamp referred to by Mr. Jamieson and hoped the inventors would receive every encouragement. There was not one gas street light in Paisley, and he wished that this gas lamp could be used successfully to compete with electricity for street lighting in other towns.

The Author's Reply.

Mr. KEILLOR, in regard to the two-part tariff system, said he reckoned that the service charge should be 25 to 30% of the total revenue. Replying to Mr. Wilson, he stated that the majority of prepayment meters were 3-light and that the price of gas was 0·067d. per therm higher in the case of the slot meter than with ordinary meters. Mr. Nisbet had raised an interesting point in connection with the water supply for instantaneous water heaters installed in tenement buildings. They had not experienced any difficulty due to insufficient supply of water, but they obtained the supply direct from the main and used a different valve for high and low pressure water supply.

A Striking Refrigerator Poster



The above photograph of a striking gas refrigerator poster was kindly forwarded to us by Mr. D. H. Helps, Engineer and Manager of the Reading Gas Company. This poster was drafted by a member of Mr. Helps' staff, Mr. N. F. D. Wardle, who was previously with the Bath Company; and it was executed by a local Showcard Writer (Mr. Tom Morley, of 8, Kings Road, Reading). The poster is about 22 in. by 35 in., and executed in two colours—the words "Chillspots" and "Refrigerators" being in light blue. The original has been framed and placed in the Reading Gas Showrooms. Mr. Helps suggests that Mr. Morley would no doubt be willing to supply copies, which, of course, would have to be re-drawn by hand, to any gas undertaking interested.

Modernizing a Fifty-Million Gas-Works

by
R. STURROCK,
Engineer & Manager of the Ardrossan Gas Department

A Paper presented at the Spring Meeting of the North British Association of Gas Managers held in Glasgow on April 3, under the Presidency of Mr. JAMES DICKSON, of Kirkintilloch.

Our Industry during the past few years has, in common with the other great industries of our country, passed through an unparalleled period of depression which to a marked degree has checked the progress, especially of those undertakings in the large industrial areas. This is exemplified in the returns of gas sold in Great Britain during the past eight years, the percentage increase for that period being 5%. In the light of recent events, however, and with the dawn of more prosperous times breaking over our horizon, we can once more look forward to brighter and, let us hope, more fruitful years that lie ahead of us.

Let us consider for a moment the hurdles over which we have passed. Unemployment, increased taxation, poor residual markets, increased electrical competition, and now increase in coal prices—all these have sapped our resources and in many places left their mark. Taking stock of our position at the present time, how many of us can truthfully say that we are satisfied with our progress in recent years? On the other hand, have we taken full advantage of the opportunities afforded us during this period of putting our house in order and preparing for future developments? Are we satisfied that our carbonizing, washing, purification, and storage plants are capable and adequate to meet any increased demands, and that our mains are of ample dimensions to carry an increased load? I am afraid many of us cannot reply to all these questions in the affirmative; we are perhaps too prone to sit back with that false feeling of security, thinking that what has been sufficient for the past will be adequate for the future. Others may find themselves in the position that though they may desire to introduce improvements they are nevertheless unable to convince their Committees or Directors that such expenditure would be justified. It is very surprising, however, that many Directors of Gas Companies who have not been in favour of spending money to improve their plant or modernize their works have been persuaded recently to sell their shares and holdings to large Financial Combines. It is difficult to understand the attitude of these people. Many of them perhaps are under the impression that our Industry is no longer in a position to give them a reasonable return from their investments. Others may be of the opinion that gas has served its day and generation, and with the coming of the so-called electric age their shares are no longer secure. If such be the case, and I believe in many instances this has been the belief which has prompted these people to take this line of action, it is rather a pity they had not been imbued by the same determined spirit possessed by the pioneers of our Industry who in the early days overcame their own difficult problems and who, by their noble example of service to their fellow-men, left us such a fine heritage. This I am convinced is the spirit which should be prevalent throughout the Industry to-day, to face the future with a determination that no obstacle, however great, is insurmountable, and to bear in mind that it is our sacred duty to uphold the traditions of the past, to endeavour by every means within our power to reduce our prices, make our wares more attractive to our consumers, and prepare ourselves to meet any demands that may be made upon our resources.

Those concerned with the manufacture and erection of our carbonizing plant have in recent years carried through research work to find ways and means of improving the efficiency of this process, and their efforts have met with a very great degree of success, as many of us who have recently had to undertake any alterations in this direction can testify. We on the production side are, therefore, under a deep sense of indebtedness to our trading friends for their foresight and labours, and should show our appreciation by taking full advantage wherever possible of installing up-to-date plant which can assist us in reducing our production costs, with a corresponding reduction in the selling price of our commodity.

At the Autumn Meeting of this Association, held at Dumfries in 1927, I had the privilege of presenting to you a Paper on the subject of "Gas Blending." In course of this Paper I described in detail the construction of a "Simplex" water gas plant which had been installed in the Ardrossan Gas-Works in 1925, at the same time giving particulars of the carbonizing returns obtained from this plant in combination with horizontal retorts. I am pleased to inform you, gentlemen, to-day that the same plant is still in operation and producing even more satisfactory results than since I last addressed you. In the interval, however, slight alterations have been made, and it may be of interest to many of the members of this Association if I briefly describe these modifications, and how they have materially assisted me in obtaining a higher degree of efficiency from my carbonizing plant.

Improvements to Water Gas Plant.

When originally installed the plant was fitted with an anti-dip arrangement which prevented any access of air through the hydraulic main during the "blow" period. This arrangement has now been replaced with a quick acting valve which is situated on the 6 in. offtake main connecting the hydraulic main and carburetting chamber. This valve has proved in practice a much more satisfactory and reliable arrangement. Another improvement was the introducing of a steam valve to control the turbine. This valve now operates simultaneously with the main control lever of the plant, and makes the whole operation absolutely foolproof. Previously it was necessary for the plantman to set the turbine in motion by operating a steam valve which was fitted to the turbine, when the plant was being changed over to the "blow" period.

Introduction of Automatic Operator.

These alterations were carried through in November, 1934, when an automatic operator was also introduced. I had approached the makers of the plant earlier that year to ascertain if they were in a position to offer me an apparatus for automatically operating the plant, and was informed that they were presently engaged devising a suitable machine to perform this function; further, that they had tried several modifications in the works without being fully satisfied with the results, but that they hoped to be in a position to offer something that would be satisfactory in a few months' time. The apparatus, which I will now describe in detail, was finally submitted and installed.

The automatic operating gear consists essentially of three main parts, a small horizontal steam engine which drives the timing gear, a steam valve and chest, and a power cylinder which effects the actual operation of the plant. The timing gear is formed by the combination of a reduction gear and time dials of a unique design. The revolutions of the dials actuate rocker levers which are attached to a steam valve chest arranged on the outside of the gear case. Steam pipes connect the power cylinder (which is arranged on the plant) and the valve chest; hence the timing gear and engine may be situated on any convenient site and not necessarily adjacent to the plant. The casing of the gear forms a complete oil bath, so that the whole apparatus is absolutely silent in working. The design is such that any cycle of working can be quickly obtained to suit varying fuels and output required—in other words, the complete cycle of working is variable, also the length of "blow" or "make" period for any cycle.

Although the gear gives such flexible working, the design is strikingly simple, being sturdy of construction and of precise action. There are no cams, springs, ratchets, or similar troublesome fittings, and being essentially slow in movement wear and tear is reduced to a minimum. The intermittent working of the power cylinder and the slow running of the engine put only a very small load on the boiler plant. In the event of the automatic gear being put out of action, the plant may be operated by one single hand lever only, and this is quite independent of the

mechanism. The connections from the valve chest on the timing gear are simply two runs of ½ in. steam pipes, both pipes acting as pressure and exhaust alternately. When the plant was first installed the cycle of operation was 6 minutes' blow and 20 minutes' run; latterly this was re-

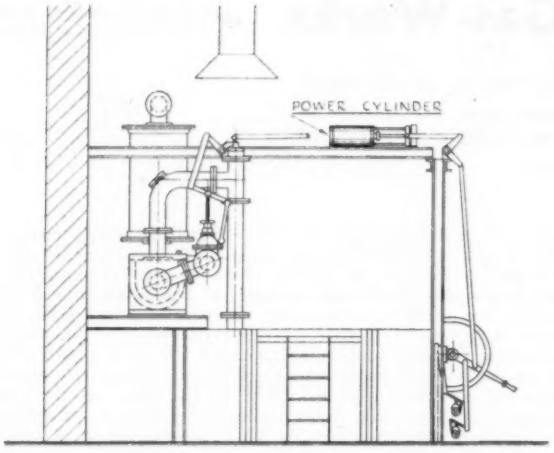


Fig. 1.

duced to 5 minutes' blow and 15 minutes' run, and this cycle was in operation when the automatic machine was introduced, the two stokers per shift of 8 hours having attended to all the requirements of the plant. With the introduction of the above apparatus the plant is now run on a cycle of 4 minutes' blow and 12 minutes' run. Previously when the plant was being operated manually it was impracticable to cut down the period of " blow " and " make " and at the same time permit the men carrying through their ordinary duties in the retort house. The installing of this automatic operator has therefore considerably improved the working conditions, and the only attention that is now required to be given by the stokers concerned is the usual pricking up, ashing out the generator, and feeding coke, which takes place at four-hour intervals, otherwise the plant is left entirely to itself. The floor space occupied by the engine and timing gear described is only 5 ft. 4 in. by 2 ft., and in our case is housed in a room apart from the plant, where the twin turbines are also situated. This prevents dirt or dust gaining access to the machinery. Fig. 1 shows a side elevation of the " Simplex " plant with the power cylinder connected. Fig. 2 gives details of the timing gear and prime mover, while figs. 3, 4, and 5 will enable you to follow my description more clearly.

Carbonizing Returns.

In my previous Paper to this Association I quoted the carbonizing returns obtained at that time, which showed that for the year 1926-27 the yield of gas obtained per ton of coal carbonized was 17,120 cu.ft. of a calorific value of 439 B.Th.U./cu.ft., giving a production of 75·1 therms per ton of coal. Prior to the introduction of the automatic apparatus, however, and consequent upon the alteration to the cycle on which the plant was being operated, these results had been improved upon to such an extent that for the year 1933-34 the yield of gas per ton was 18,194 cu.ft. of a calorific value of 436 B.Th.U./cu.ft., which was equivalent to a production of 79·3 therms per ton. Since the introduction of the automatic operator the returns for the 12 months ended Jan. 31, 1936, are as follows:

Gas made	51,981,000 cu ft.
Coal carbonized	2,614 tons 12 cwt.
Gas produced per ton	19,881 cu.ft.
Calorific value of gas	436 B Th.U./cu.ft.
Therms produced per ton	86·7

The composition of a sample of the blue water gas taken during the last minute of the run period, before the alterations, showed the following result (5 minutes' " blow," 15 minutes' " run "):

	%
Carbon dioxide	8·2
Unsaturated hydrocarbons	*Nil*
Oxygen	0·6
Carbon monoxide	31·8
Methane	1·19
Hydrogen	53·05
Nitrogen (by difference)	5·15
	100·00

Calculated calorific value, 290 B.Th.U./cu.ft.

Since the plant has been put to work on the mechanical operator, however, and operated on a cycle of 4 minutes'

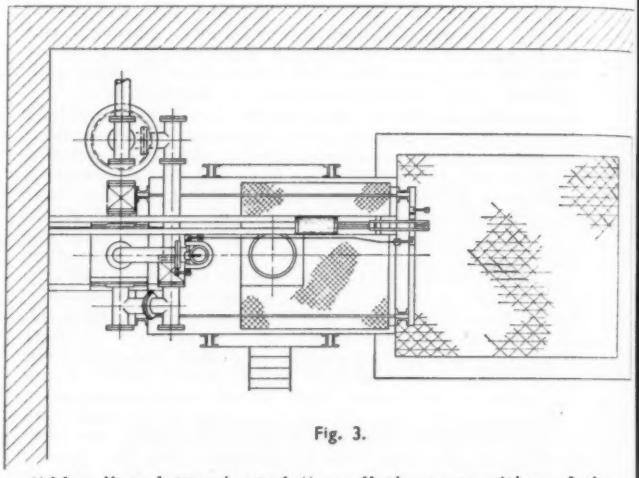


Fig. 3.

" blow " and 12 minutes' " run " the composition of the blue gas produced during the last minute of the run was found to be as follows:

	%
Carbon dioxide	7·8
Unsaturated hydrocarbons	*Nil*
Oxygen	0·4
Carbon monoxide	31·6
Methane	1·04
Hydrogen	55·28
Nitrogen (by difference)	3·88
	100·00

Calculated calorific value, 295 B.Th.U./cu.ft.

The analysis of the mixture of " straight " and " blue " gas supplied prior to last year was:

	%
Carbon dioxide	7·2
Unsaturated hydrocarbons	2·2
Oxygen	0·6
Carbon monoxide	14·2
Methane	18·4
Hydrogen	48·2
Nitrogen (by difference)	9·2
	100·0

Gross calorific value (determined by Boys calorimeter), 437 B.Th.U./cu.ft.

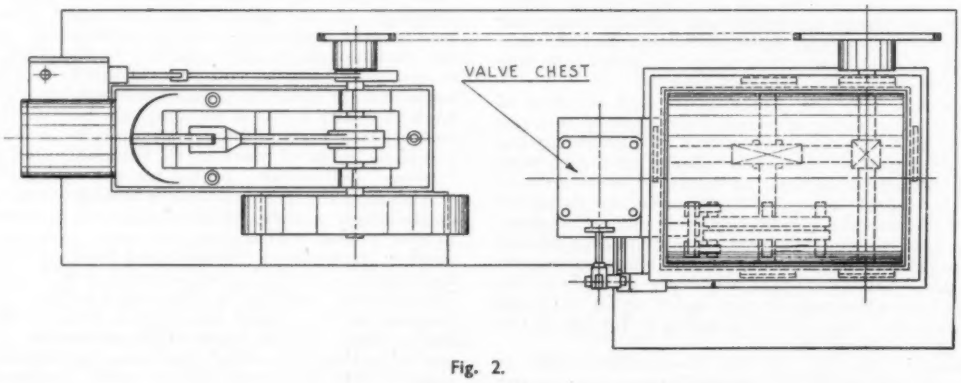


Fig. 2.

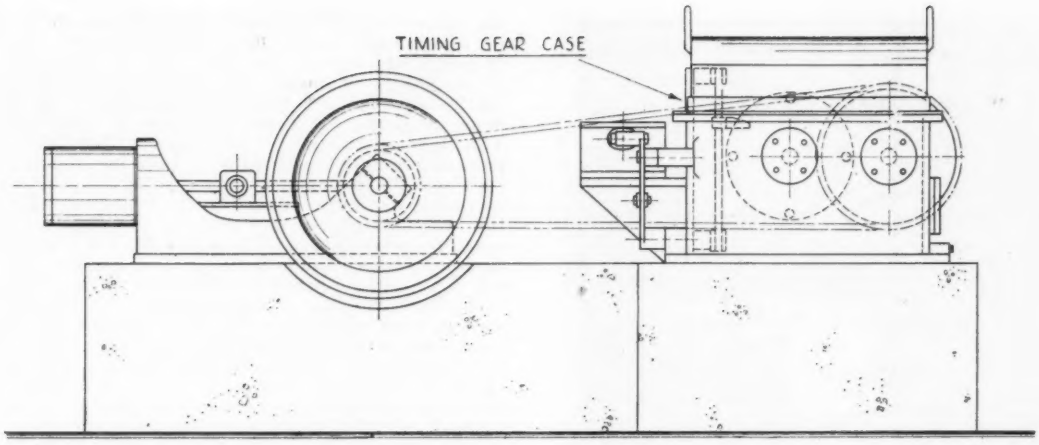


Fig. 4.

The average composition of the mixed gas presently supplied is:

	%
Carbon dioxide	7·6
Unsaturated hydrocarbons	2·0
Oxygen	0·6
Carbon monoxide	15·0
Methane	17·8
Hydrogen	49·4
Nitrogen (by difference)	7·6
	100·0

Gross calorific value, 434 B.Th.U./cu.ft.

During the peak load last winter when over 220,000 cu.ft. of gas per day was being delivered from the Works, it was apparent that should the demand in future increase one water gas generator would be insufficient to produce the quantity of "blue" gas necessary for mixing with the volume of "straight" gas from the horizontal retorts. We are, therefore, presently engaged in having an additional "Simplex" water gas plant installed which will not only assist by giving a higher degree of efficiency in production next winter, but will also permit of any necessary repairs to the original plant being carried out in the summer months. For example, in the month of August last year with 12 coal gas retorts in operation, and the water gas plant working 24 hours per day a make of 20,456 cu.ft. was obtained. The calorific value of the gas was 439 B.Th.U./cu.ft., which is equivalent to 89·8 therms per ton. In the month of December, however, when 18 coal gas retorts were in operation, and having only one "Simplex" plant, my production fell to 19,382 cu.ft. per ton, and it was impossible to bring down the calorific value to the desired quality. With the addition of this extra generator I shall, therefore, be in a position to obtain not only more uniform "makes" per ton, but a more uniform quality than has hitherto been possible. This combination of horizontal retorts and twin water gas generators affords a flexibility which would be difficult to obtain with any other modification of carbonizing plant.

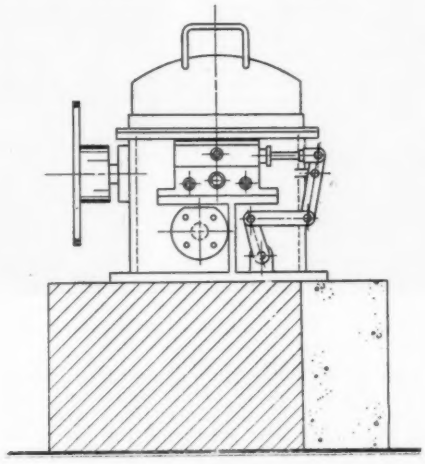


Fig. 5.

Tar Extraction and Preheating.

Another apparatus which has materially improved the efficiency of the purification process was introduced into the Works about two years ago, in the form of a tar extractor of the Pelouze and Audouin type.

I had experienced trouble, particularly in the warmer

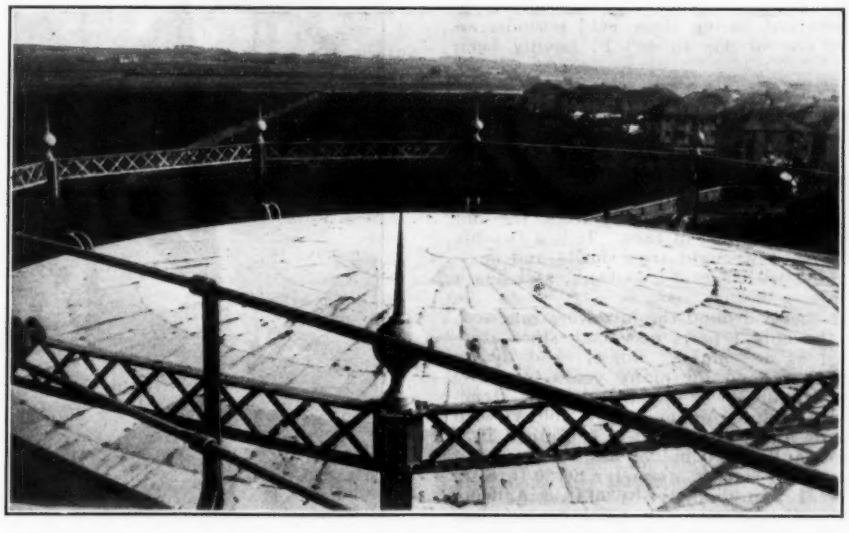


Fig. 6.

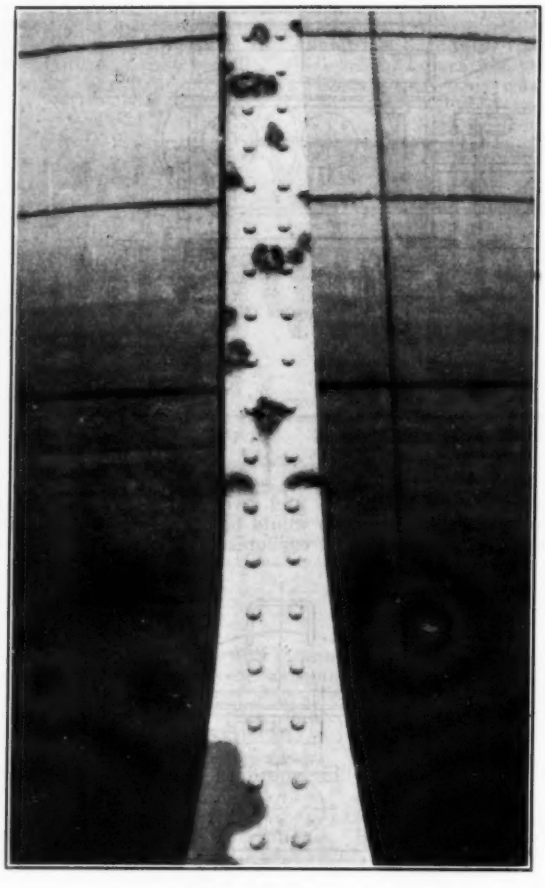


Fig 7.

weather, with the secondary tars being carried forward into the washing and scrubbing plants and from thence into the purifiers. This not only caused back pressure on the exhausting plant, but also shortened the life of the oxide of iron in the purifying boxes and depreciated its marketable value. This apparatus, which has a capacity of 350,000 cu.ft. per day, is situated between the outlet of the exhauster and the inlet to the scrubbers, and since commencing operations no recurrence of the troubles referred to has been experienced.

When the above apparatus was installed a preheater was also fitted on the inlet main to the purifiers. In very cold weather it was found that the temperatures in the boxes, even though they were under cover, were falling below 40° F. When this occurred the usual disadvantages were experienced, especially when the oxide in the boxes had been in use for some time. The introduction of the preheater, however, has proved a very effective means of increasing the temperature during these cold periods, an average temperature rise of 35° to 40° F. having been obtained.

Experiences with a Steel Gasholder in Proximity to Sea Air.

When the Ardrossan Town Council decided in 1903 to transfer their gas-works to the present site, two gasholders were erected, one of which was removed from the old Works where it had been installed in 1880. It is a two-lift column-guided holder with wrought iron sheets and cast-iron girders, is provided with a cast-iron tank, and has a capacity of 60,000 cu.ft.

Four years ago the sheets around the lute were renewed, and this represents the only repairs necessary since erection. It is now used as a "make" holder, and by its general appearance looks good for many years to come. The other gasholder provided was an entirely new structure. It is a two-lift column-guided steel holder with latticed steel standards and girders and is contained in a concrete underground tank. This holder has a capacity of 200,000 cu.ft., the inner lift is 80 ft. diameter by 20 ft. 6 in. deep, and the outer 82 ft. 2 in. diameter by 20 ft. 6 in. deep. The crown sheeting consists of one ¼ in. thick centre plate 5 ft. in diameter, and eight courses of sheets. The inner and outer courses are 12 gauge, the intermediates 14, and the outer course ⅜ in. thick. The side sheets of the inner lift are in eight courses, the top course 2 ft. 6 in. wide by 12 gauge, the bottom 2 ft. 6 in. wide by 10 gauge, and the intermediates 14 gauge. The eight courses of side sheets on the outer lift are of the same dimensions, the top sheets being 10 gauge, the bottom 12, and the intermediates 14. This holder, though it had been scaled, brushed, and painted regularly, was showing signs of corrosion when I took over the management of the Works 11 years ago. This corrosion was more apparent on the crown sheets and on the lattice standards and girders, and steps were at once taken to counteract it. The parts affected were thoroughly cleaned, scraped, wire brushed, and treated with linseed oil. Two coats of genuine red lead paint were then applied, and afterwards the whole structure was covered with a coat of good quality oxide paint. Despite these precautions, however, within eighteen months the parts, especially those on the standards and girders which had been treated, again showed signs of scaling, and it was possible with a penknife to dislodge a section of the metal. This portion when closely examined distinctly showed the layers of paint on the outside, but the internal portion proved that the decay of the metal had not been arrested in the slightest; in fact, certain parts of the structure were so badly affected that the corrosion had eaten right through the section of metal. In the course of the next year the portions on the crown and side sheets which had been treated were also showing signs of scaling. The parts affected in the first instance were around the seams of the sheets, but latterly leakages occurred over the whole area, over 300 patches having to be inserted, these being fixed in the usual manner with split T bolts and iron caps centrally bored. The photograph, fig. 6, was recently taken, and shows the crown of the holder with the patches referred to clearly distinguishable. In this same photograph a portion of the top girder is also seen, from which you will observe to what extent the metal has decayed. From figs. 7, 8, and 9 the condition through corrosion to the standards, girders, and side sheets can be plainly detected.

This holder is situated in proximity to the sea, in a very open and exposed position, and though the corrosion to the sheets is more acute on the side exposed to the water, nevertheless corrosion is also apparent on the sheltered and landward side. The general condition of the holder, despite all efforts to prolong its life, was such that it was

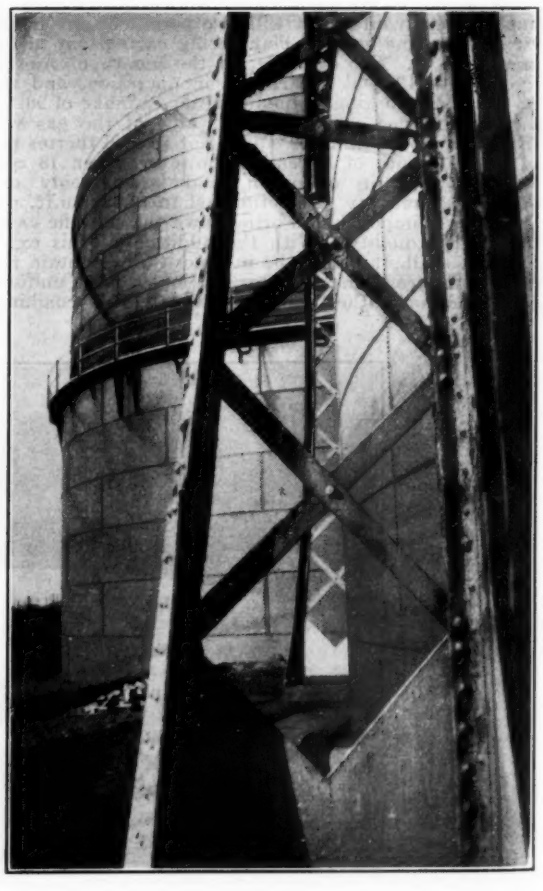


Fig. 8.

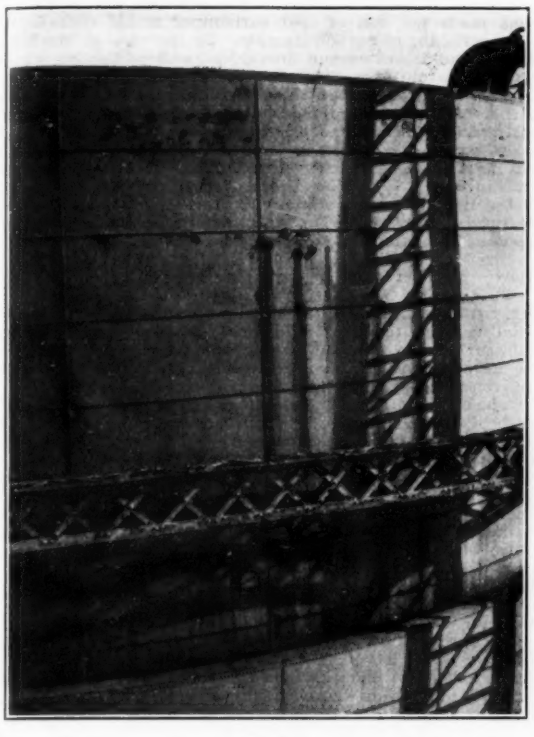


Fig. 9.

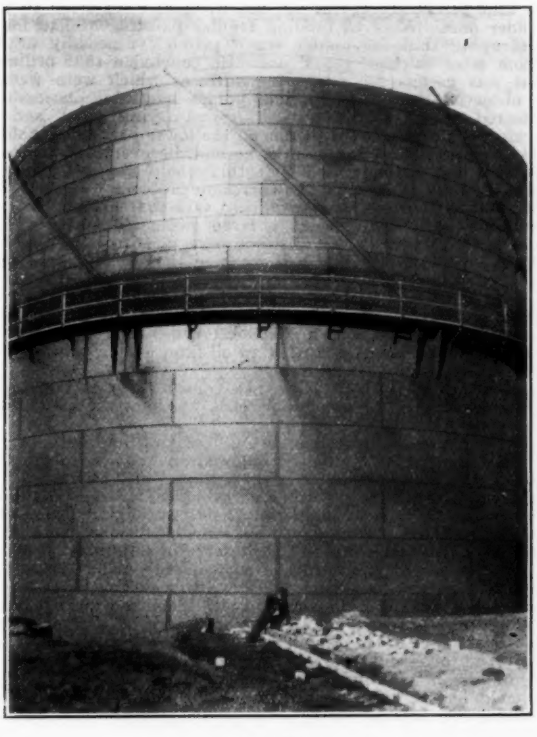


Fig. 10.

decided to have it dismantled and replaced with a holder of the spirally guided type, the sheets and plates of which would be of iron and of a thicker section of metal than had previously been used. Before proceeding to dismantle this holder it was essential that alternative storage be provided, the 60,000 cu.ft. "make" holder being inadequate even during the lightest load to meet the requirements of the district. We were, however, fortunate in having plenty of ground space available for extensions, and it was finally decided to erect an additional gasholder and tank.

Erection of New Gasholder and Tank.

Accordingly a single-lift spirally-guided gasholder and tank was erected last summer. This holder, which is shown in fig. 10, has a capacity for storing 100,000 cu.ft. It is 68 ft. diameter by 28 ft. deep, the tank, which is above ground level, is 69 ft. 6 in. diameter by 28 ft. 6 in. deep. The centre crown sheet of this holder is $\frac{1}{4}$ in. thick, the outer row next curb $\frac{5}{16}$ in., and the intermediate rows 9 B.G. in thickness. The side sheets are ten rows in depth, the top and bottom rows are $\frac{5}{16}$ in. thick, and the intermediate rows 9 B.G. All these sheets and plates are of genuine puddled wrought iron which were manufactured in Scotland. The holder, which was erected by Messrs. Robert Dempster & Sons, Elland, was completed without any oil or paint being applied to the plates or sheets, this being in accordance with the specification, as I had specifically stated that the contractor had to allow for the painting of the internal seams and joints of the gasholder and tank only, and on no account must any other part of the structure be treated with oil or paint. My reason for inserting this clause being the result of tests which I had carried out over a number of years with metal strips exposed to the atmospheric conditions. I came to the conclusion, as the result of these tests, that it was essential to allow the new metal sufficient time to weather, or in other words to allow the bloom on the sheets and plates to scale before applying any paint. The erection of the gasholder and tank was therefore completed, tested with air and gas and found to be perfectly sound without any paint having been applied. Three months elapsed before the whole structure was sufficiently flaked to proceed with the painting. It was then thoroughly scaled and scraped, after which it received one coat of genuine red lead paint and a finishing coat of silica graphite paint, the crown only being given a second coat of finishing paint. With the addition of this holder we are now left in a position to proceed with the dismantling of the steel holder, and it is intended that this work shall be commenced and the new holder completed early this summer.

A Profitable Policy.

It will be observed from the foregoing that the policy adopted has been one of gradually introducing plant in an endeavour to improve the efficiency of the carbonizing process and to increase the capacity of the Undertaking. This policy has proved of great advantage, the improvements introduced having coincided with increased sales, with the result that in recent years we have reduced our production costs by over 1s. per 1,000 cu.ft., these reductions when effected having been passed on to our consumers.

In Ardrossan we find ourselves in the position that large industries in our vicinity have recently been enlarging and centralizing their works; this has created a demand for additional houses which are rapidly being erected. These houses will be equipped with gas cookers and wash boilers and at least one gas fire, and it was essential, therefore, that we should prepare ourselves to meet this extra demand.

In conclusion, gentlemen, permit me to express the hope that my effort may have proved of general interest to you, and that it may evoke a live and interesting discussion.

Discussion.

Mr. D. Vass (Perth) considered that it was important to paint the inside surface of the gasholder sheets to prevent corrosion. He had examined the inside of a tank after ten years and found considerable corrosion, but after painting with a good preservative the corrosion was arrested for a long period.

Mr. E. L. Farquhar (Kennoway and Largo) asked if there was any marked difference in the composition of the gas made in the water gas plant following the incorporation of the mechanical operator. The increased efficiency, he said, was a natural outcome of keeping to a strict time-table for the "blow" and "make" periods since the fuel would be maintained at the proper temperature and the productive time of the plant increased. He would also like to know what Mr. Sturrock's experience had been with the automatic operator from the mechanical aspect and also whether there had been any change in the quality of coke or in the steam pressure used after the adoption of this operator.

Mr. John Wilson (Dundee) did not agree with Mr. Sturrock's statement that "*It is very surprising*, however, that many Directors of Gas Companies who have not been in favour of spending money to improve their plant or modernize their works have been persuaded recently to sell their shares and holdings to large Financial Combines." He thought that if Directors of Gas Companies were not prepared to modernize their plant, they *should* sell.

Mr. J. Bell (Dumbarton) said that corrosion of holders was a very serious problem and he wondered whether a change in the quality of the steel or the paint used was responsible for the

fact that recent structures did not withstand corrosion so well as older ones. Notwithstanding regular painting he had found on scraping that his holder was "pitted" especially at the bottom after thirteen years' use. He concluded that ordinary paint was useless for protecting surfaces which were wetted. He observed that the cups and guides had been successfully protected from corrosion with a non-drying paint and he therefore experimented with this on the lower part of his holder. After a period of twelve months he had discovered no traces of corrosion and he suggested that this would appear to be the proper manner of tackling the corrosion problem.

Mr. JAMES DICKSON (Kirkintilloch) said that his predecessor, Mr. James Bell, had erected a large gasholder which, at the time he took over, showed distinct signs of corrosion. He had erected a small holder and had specified the use of "charcoal" iron for its construction. He now used the large holder for town gas and the small one for water gas. He had tried the non-drying compound referred to by Mr. Bell and had not found it altogether successful, but he had obtained good results by protecting the holder surfaces with an oil-film, and in this way the spiral guides were also lubricated.

Mr. R. MILNE (Provan, Glasgow), considered that the repairing of holders by welding on patches was most successful and economical.

Mr. W. WILSON (Caledonian Gas Corporation) did not like welding since in his opinion it imposed an undue strain on the seam of the weld. He referred to a Paper on "Corrosion" he had given in which he described a gasholder built at Burton-on-Trent using the best wrought-iron sheets available. These were made in Scotland. There had been some corrosion on the inside surfaces of the holder due to the presence of sulphuretted hydrogen in the water as a result of incomplete purification of the gas. Mr. Wilson congratulated Mr. Sturrock on the results of his water gas plant. He would like to know the yield of water gas per ton of coke and the percentage of water gas in the town gas supply. He then referred to the considerable proportion, 7½%, of carbon dioxide contained in the mixed gas. It was important to eliminate this gas more especially when gas was sold by the therm, since a 5% removal of carbon dioxide caused a 10% increase in the calorific value of the gas. Carbon dioxide, besides being a diluent, smothered the flame and caused imperfect combustion. When gas contained more than 8% of carbon dioxide the smell of gas due to incomplete combustion was apparent. Moreover, this carbon dioxide was a valuable ingredient. Taking Mr. Sturrock's conditions, the 20,000 cu.ft. of gas made per ton of coal carbonized would contain 1,500 cu.ft. or 186 lb. of carbon dioxide. In the case of Burton-on-Trent, if the 5% of carbon dioxide present in the gas was extracted and sold, the 1,000 tons of carbon dioxide obtained which could be valued at £18,000 would pay for two-thirds of the coal bill. He considered that this point would well repay investigation, since success in this direction would cheapen the price of gas, which would automatically increase the demand.

Mr. J. K. DICKIE (Auchengeich Coking Plant) made reference to a Paper on "Corrosion" read recently by Dr. McCance before the West of Scotland Iron and Steel Institute which showed that the composition of the water in the holder would largely determine the extent of the corrosion.

The Author's Reply.

Mr. STURROCK, in reply to Mr. Vass, said that he had opened a small holder after a period of thirty years and found that the inside surfaces of the iron plates, which had not been painted, were hardly marked. He agreed with Mr. Farquhar that the improvement in the results obtained by the installing of the mechanical operator in the water gas plant was due to the removal of the irregularities which occurred, especially during the night when there was no supervision of the man operating the plant. There had been no change in the quality of the coke or in the steam pressure at the time of the introduction of the mechanical operator. The four years' experience he had gained in a steel works laboratory and smelting shop showed him that there was a change in the methods of steel manufacture between 1897 and 1903. The steel structures erected during those years all showed signs of pitting. It was his intention to experiment with the oil-filming method of preventing corrosion referred to by Mr. Dickson.

Like Mr. Wilson, he also specified the use of Scottish wrought-iron sheets for the construction of his new holder. There was 30-33% of water gas in the mixed gas supply. He agreed with Mr. Wilson in his remarks relating to the effect of the presence of carbon dioxide on the efficiency of gas burners, and he was endeavouring to decrease the percentage in his own supply. He was aware of the effect of the composition of the water on the extent of corrosion of the holder, and the Ardrossan Water Department were at present trying out methods for the removal of the free lime.

THE MANUFACTURE, TESTING, AND PROTECTION of Steel Pipes for Gas Distribution

We publish below a report of the discussion which followed the Paper read by Mr. J. H. Smith (of Messrs. Stewarts & Lloyds, Ltd.) before a Meeting of the Western Junior Gas Association at Cheltenham on March 21. An abstract of the Paper appeared in last week's "JOURNAL."

Mr. B. G. HAWKINS (Plymouth) asked if the author could explain a blistering which had come to his notice during the welding up of a line of 6-in. seamless inserted-joint tubes. There was no leakage of gas, but the blistering led one to expect trouble at a later date. He also enquired whether water gas was used for heating the furnaces as well as for welding. In welding very large pipes, was an overlap made in the welding to ensure a homogeneous joint? Also, in piercing operations for the Pilger process, did the piercer rotate?

Mr. E. ENGLISH (Bristol) said he thought intensified corrosion would take place round the "flash" on electrically welded pipes.

Mr. A. C. SHILSON (Weston-super-Mare) enquired what relation the Corfield "Index" had to the weight of the specimen taken for the test.

Mr. E. G. F. MURRAY (Plymouth) asked for a further explanation of the length of the mandrel on, say, a 50-ft. length of pipe. Also, had the corrosive nature of the soil a direct relation to its *p*H?

Mr. K. L. CLARK (Weston-super-Mare) asked what length of time was considered necessary for a tube coated inside with linseed oil to remain in stock in order to oxidize the oil.

Mr. V. J. BORRETT (Trowbridge) asked whether complete dehydration of gas was possible by compression, and whether any benefit from reduced internal corrosion resulted from reducing the dew point to 34° F.

The Author's Reply.

Mr. J. H. SMITH, replying to the points which had been raised, said a case of blistering such as that mentioned had not previously come to his notice. The only explanation he would suggest was that there had been a small lamination and/or oxide inclusions at the affected part, and that as the result of heating there had been inter-action between the oxide inclusion and the carbon of the steel, with generation of gases sufficient in volume and pressure to form a blister at the laminated portion of tube wall.

Regarding the heating of welding furnaces, producer gas was generally used, the use of water gas being confined to the hand-welding process as described for the manufacture of large-diameter tubes.

On the question of welding a large pipe a certain overlap was necessary to ensure a satisfactory weld, the further re-heating of the whole tube for the rounding operation ensuring structural uniformity of the metal. As regards the piercing operation in the manufacture of seamless pipe by the Pilger process, the piercing point was fixed, the billet itself being rotated round this by the action of the skew rolls. The mandrel bar on which the pierced bloom was forged out in the Pilger mill was about 9 ft. long, the tube as it was formed slipping forward on this as it was progressively elongated. The mandrel bars were of special alloy steel such as chrome-nickel-molybdenum. As regards soil corrosivity, in acid soils the *p*H value was a direct measure of the corrosivity.

Replying to Mr. Clark, the drying of linseed oil was an oxidation effect, both light and air being essential to harden the film. Under favourable conditions of exposure to light and air the coating would surface harden in about eight hours, but under unfavourable conditions, such, for example, as in small bore tubes where, owing to the absence of light, the oxidation process was relatively slow, from eight to fifteen days would be required for the coating to become really set. Complete dehydration did not result from normal compression pressures, but so long as the moisture did not condense in the pipes corrosion would be reduced.

Regarding the bead left on electrically welded pipe, in the absence of a protective coating and failing heat-treatment of the pipe after welding, it would appear reasonable to expect that corrosion either at the weld or on the metal adjoining

would be stimulated by the difference in potential arising out of the structural non-homogeneity.

In a length of electrically seam-welded main used for high-pressure natural gas, which he had the opportunity to examine about a year ago, there was no indication that the metal at or adjoining the line of weld was more susceptible to corrosion than the metal remote from the weld.

As regards the Corfield soil corrosivity test, the weight of the specimen bore no relation to the corrosivity index, being dependent on the thickness of tube used for the test. Provided a standard area of the metal surface was exposed, the same corrosivity index figure would be obtained with any particular soil irrespective of the thickness or weight of specimen used. The specimen used in their tests was a 4-in. length of 1 in. o/d × 10 w.g. seamless steel tube weighing about 180 grammes.

As previously mentioned, the loss in weight in grammes was taken as the corrosivity index, the classification being as follows:

Index Limits.		Soil Corrosivity.
0·00–0·99	..	Slight
1·00–3·99	..	Moderate
4·00 and over	..	Severe

The meeting concluded with a vote of thanks proposed by Mr. A. TRAN (Bath) and supported by Mr. J. T. SPENCER (Weston-super-Mare), to which Mr. J. H. SMITH suitably replied.

Sheffield Gas Company's Special Order Application

Barnsley Corporation Objects to Board of Trade Enquiry

A further stage was reached in the negotiations between the Sheffield Gas Company and the Barnsley Gas Company for the purchase by the former of the undertaking of the latter when the Draft Special Order promoted by the Sheffield Company came before the Director of Gas Administration of the Board of Trade on April 4.

The Sheffield Gas Company was represented by Mr. W. TYLDESLEY JONES, K.C., and Mr. S. G. V. FITZGERALD, and the Barnsley Corporation was represented by Mr. F. J. WROTTESLEY, K.C., and Mr. H. ROYSTON ASKEW.

Mr. TYLDESLEY JONES said the area of the Barnsley Company adjoined that of the Sheffield Company and that the great majority of the area of the Barnsley Company was actually in the limits of supply of coke oven gas by the Sheffield Company. The terms agreed between the two companies were the payment of £160,000 in cash and the taking over of £30,000 5½% perpetual debenture stock of the Barnsley Company. He had at the enquiry evidence to justify those terms and to show how much better served the area of the Barnsley Company would be under the Sheffield Company having regard to the facilities and experience of the latter in the very large area which it now administered. It was contended that if the Barnsley area was incorporated with that of the Sheffield Company it would benefit from the economies which could be made as a result, that the charges to the Barnsley consumers would be reduced, and that much more rapid development would take place having regard to the fact that the Sheffield Company had a large research department. He did not know whether the Barnsley Corporation objected to the enquiry being held at all now, or whether it was a question of the terms and conditions of sale.

Mr. WROTTESLEY said his application was that there should not be an enquiry with regard to this proposed Special Order at all, in order that this Corporation should have an opportunity of promoting a Bill in the next Session of Parliament to acquire the Barnsley Gas Company's undertaking compulsorily. Explaining the reasons for making this request, Mr. Wrottesley said the negotiations between the two companies had been carried on without any communication with the Barnsley Corporation and nothing was known by the Corporation that anything was being done in the matter until a notice was inserted in the Press on Oct. 12 last intimating that there had been a meeting of shareholders to consider the proposed sale, and at that meeting the agreement between the two companies was ratified. There had been a notice of the meeting in September but there had been no communication between the Barnsley Company and the Corporation. When the Corporation realized that these negotiations had been going on it immediately instructed its experts—Mr. Valon, the Consulting Gas Engineer, and Mr. Collins, the Accountant—to investigate the advisability of the Corporation purchasing the Barnsley Gas Company's undertaking, as that Company was apparently willing to sell. The Draft Order of the Sheffield Company was not issued until Jan. 16, 1936, and the Corporation experts could not complete their investigations until they had had an opportunity of studying the Draft Order. Thus the reports of the experts were not received until February, and consequently it was impossible, in accordance with the procedure of Parliament, to promote a Bill this Session. The experts recommended that the Corporation should promote a Bill to purchase the Barnsley Gas Company's undertaking, and a copy of their recommendations had been sent to the Board of Trade.

The DIRECTOR pointed out that a late Bill could have been promoted.

Mr. WROTTESLEY replied that that had been considered, but he had been told that it was not the practice of the authorities to welcome late Bills, and that in this case there would have been very little chance of such a Bill being allowed. The Corporation had definitely resolved to promote a Bill to buy out the Gas Company next Session and in those circumstances he asked that the present enquiry should not be proceeded with as it would be a waste of the Director's time and of the Corporation's money, inasmuch as the whole ground would be gone over by a Parliamentary Committee.

There was strong objection by the Barnsley Corporation to their local gas undertaking being acquired by the Sheffield Company which had such absorbing interests elsewhere.

Mr. TYLDESLEY JONES asked the Director not to accede to the request made on behalf of the Barnsley Corporation. He pointed out that the Corporation was aware by the Press notice last September what was going on and there had been ample time to deposit a Bill this Session. Moreover, he did not agree with the advice given to the Barnsley Corporation by its Parliamentary Agent as to the position regarding late Bills, and in any case it was the usual practice to consult the authorities of the House in these matters, which he assumed had not been done in this instance.

Mr. WROTTESLEY said the Barnsley Corporation was perfectly willing to apply for a late Bill this Session if the Board of Trade thought that should be done.

Mr. TYLDESLEY JONES said he ventured to think it would be a very bad precedent indeed to accede to the request of the Barnsley Corporation, because local authorities had no statutory rights to purchase gas undertakings as they had to purchase electricity undertakings. Moreover, his case in support of this Special Order was that it would be in the interests of the consumers in Barnsley that they should be supplied by a large undertaking like the Sheffield Company with its research department and huge output. If the enquiry was held and the Board of Trade made the Order, the Barnsley Corporation had the right to ask Parliament to send it to a Special Committee.

The DIRECTOR remarked that in 1923 the Barnsley Company promoted a Special Order but there was no opposition from the Barnsley Corporation.

Mr. WROTTESLEY said the question of compulsory purchase had not arisen until these negotiations made it plain that the Barnsley Company was anxious to sell out.

Mr. TYLDESLEY JONES said that in 1919 the Company was willing to sell on terms, and now the Company was willing to sell to the Sheffield Company on terms which had been agreed.

The DIRECTOR, after deliberating in private for a short while, said he would hold the enquiry, and if the Order was granted he would make a special report to the Special Orders Committee.

Mr. ASKEW, for the Barnsley Corporation, said that in these circumstances Barnsley would take no part in these proceedings.

The Barnsley representatives then withdrew and the Draft Order was considered as an unopposed one.

Consideration of the Draft Order.

Mr. TYLDESLEY JONES, dealing with the case for the Draft Special Order, said that the supply of gas in the area of the Sheffield Gas Company had now reached the enormous quantity of 6,900,000,000 cu.ft. per annum. The output of the Barnsley Gas Company, on the other hand, was the comparatively small one of 200,000,000 cu.ft., and there was not the slightest doubt there was room for the introduction of greater efficiency and economy in the conduct of that undertaking if it were made part of the much larger Sheffield undertaking. As he had already stated, the purchase price was to be £160,000 in cash and the taking over of the £30,000 5½% perpetual debentures. It had been deliberately decided to pay the £160,000 in cash because the Sheffield Company could raise capital at a very cheap rate, it being anticipated that the raising of the £160,000 and the payment of the 5½% debenture dividend would not average more than 4%. On that basis, the present profits of the Barnsley undertaking would be adequate to meet these charges at the beginning, quite apart from any economies that would be effected in dealing with the undertaking.

Mr. *Ralph Halkett*, General Manager and Secretary of the Sheffield Gas Company, said that the output of gas of his Company had increased from 4,778,000,000 cu.ft. in 1931 to

6,900,000,000 cu.ft. in 1935, while during the first quarter of 1936 there had been an increase of 20% in sales over the corresponding period of 1935. Speaking of the industrial sales, he said these formed a large proportion of the total, due in the main to the activities of the Research Department of the Company. That Department was in touch with all the industries in Sheffield and it was seldom that any new plant was put in but that the Company's Research Department had been consulted in some form. The Department was constantly advising consumers and assisting them in the application of gas to their particular industrial processes, and the small undertaking of the Barnsley Company could not afford to run such a department and therefore could not render such services to the consumer. The price of gas in Sheffield varied from 9d. to 1·9d. per therm according to quantity, the basic price being 7d. per therm. In this Order a basic price of 9·6d. per therm was being asked for, which was the present price of gas in Barnsley. The gas supplied to the Barnsley area would be coke oven gas taken from the Silkstone Colliery, where over 3,000,000 cu.ft. per day was available.

Mr. *George Evetts*, Consulting Engineer, said he had been consulted from time to time by both the Barnsley and the Sheffield Companies, and added that as on the basis of the present price in Barnsley the profits were more than sufficient to provide the necessary capital charges on the purchase price—assuming 4%—the Barnsley consumers would not suffer, but, on the contrary, they would get immediate benefit from the economies which must inevitably be made when Barnsley became part of the Sheffield undertaking. The total charges would be £8,050 whereas the average profits for the past five years had been £8,483. The Order asked for a differential of 3d. per therm as between the existing Sheffield area and Barnsley. Actually at the present time the costs of production in Barnsley were 4·64d. per therm higher than in Sheffield, but a differential of that amount could not be justified because of the large quantity of gas sold in Sheffield for industrial purposes which made a close comparison between the two areas a little difficult. However, taking all the conditions into account, he regarded a 3d. differential as a reasonable one. He added that whereas the business of the Sheffield Company was constantly expanding, the accounts of the Barnsley Company showed that their business was more or less stagnant. Nevertheless, he saw no reason why, with the same business methods as those adopted by the Sheffield Company, the Barnsley business should not develop rapidly in the future. On the other hand, if the Barnsley Company were taken over by the Barnsley Corporation he had little doubt that no greater progress would be made in the future than had been shown during recent years, for the reason that a small self-contained undertaking could not hope to progress in the way a much larger undertaking could.

Mr. *A. White* (Messrs. Cash, Stone, & Co., Accountants) said the adjusted profit made by the Barnsley Company in 1935, after allowing for a reduced assessment for rates, amounted to £8,515, which was more than sufficient to meet the charges on the purchase money on a basis of an average of 4% as between raising the £160,000 and the 5½% interest on the £30,000 debentures. That being so, the consumers in Barnsley would at once benefit from the economies which amalgamation with the Sheffield undertaking must inevitably bring about. Mr. White then gave figures showing that the cost of gas in Barnsley would be 9·6d. per therm if allowance had been made in the Company's accounts for the increased cost of coal, coal undercharged, and the capital charges involved in the purchase, and that figure was the basic price he had advised the Sheffield Company to ask for, or a differential of 3d. as compared with the price of 6·6d. per therm to ordinary consumers in Sheffield.

The Hong Kong and China Gas Company, Ltd.

The Annual General Meeting of the Shareholders of the Hong Kong and China Gas Company, Ltd., was held at the Company's Offices, 148, Gresham House, Old Broad Street, E.C., on Monday, March 30, 1936—Mr. ROBERT H. GLEN, F.C.A. (Chairman), presiding.

The SECRETARY (Mr. S. F. Field) read the notice convening the Meeting and the Auditors' Report.

The CHAIRMAN: Gentlemen, when I last had the pleasure of addressing you on April 4, 1935, I referred to an unprecedented trade depression which the Colony of Hong Kong was then experiencing. I am sorry to say that this depression continued throughout the whole of the past year and, in addition to this, the Colony was severely hampered by the violent Exchange fluctuation during this period. To give an illustration of the fluctuation which occurred, I would mention that the year commenced with an Exchange rate of 1s. 8½d. per dollar. By early March this had risen to 2s. and during the latter part of April the rate even reached the figure of 2s. 6d. per dollar, which is the highest figure the dollar has stood at for some years. From June last a steady fall was experienced with a sudden drop in November, until at the end of December, 1935, the rate was 1s. 3½d., a fall of no less than 1s. 2½d. per dollar during a period of eight months.

During the latter part of the year the exportation of Hong Kong Silver Dollars and Silver Bullion, &c., was prohibited by the Government and an Ordinance passed to provide, amongst other things, for the issue by the Treasury, of one-dollar legal tender currency notes to replace the existing Silver dollar coins. The measures taken by the Hong Kong Authorities appear to have checked the abnormal exchange fluctuation as will be noticed from the fact that during the present year exchange has remained steady at round about 1s. 3½d. per dollar.

Considering the monetary position in the Colony during last year, it is not surprising that business generally suffered severely. The Board, however, look forward with confidence to the future, now that exchange is more steady.

Turning now to the Accounts as before the Meeting, I will first briefly refer to the new item appearing in the Capital Account of £50,000 4% debentures. You will remember I mentioned at the last General Meeting that the Board had decided to make a new debenture issue during 1935. It was decided that the old 5% debentures amounting to £40,050 be redeemed on Oct. 31 last, and a new issue of £100,000 4% debentures be made. Of this amount £50,000 were applied for and have been issued, leaving an amount of £50,000 to be issued later as and when required.

Additions to Capital amount to £32,298 5s. 8d. This figure covers the cost of land purchased at Kennedy Town, to which site our West Point 500,000 cu.ft. holder has been removed, further expenditure on our new Kowloon Works and the laying of high-pressure steel Mains.

The sales of gas at both Hong Kong and Kowloon show a decrease as compared with the previous year. My foregoing remarks as to trade conditions in Hong Kong partly explain this. At Hong Kong 12½ millions less gas was consumed and at Kowloon 1½ millions. There is, however, another very important reason—viz., the efficiency of present-day gas appliances. The Company has replaced a considerable number of old gas appliances with up-to-date models, and our customers have received the benefit of first-class cookers, geysers, &c., which consume less gas and are more efficient in every way than the older types.

Coal carbonized cost $176,016, as compared with $199,964, a reduction of $23,948, being mostly due to less coal carbonized. The cost of C.W.G. manufacture is higher by $2,713, the respective figures being $21,247 for year 1935, as against $18,534, more water gas being made.

Working Expenses show a slight increase of $2,831. It was found necessary to send a further Assistant Engineer to Hong Kong during the early part of year 1935.

The cost of maintaining the retorts and the C.W.G. plant is $10,231, and for the maintenance of Mains $10,252, which figure is about the same as the preceding year. Maintenance of works cost $60,443, as against $63,177.

Bad debts again show a reduction of $478, when compared with year 1934, which your Board consider is very satisfactory in view of the depressed state of the Colony. Publicity is lower by $2,627.

Fittings written off is $15,679, as compared with $24,481. It has been our policy in previous years to scrap and write off out-of-date gas appliances, and the same action has been taken in respect of year 1935. The bonus to staff and workmen is lower by $7,223, this being solely due to the lesser dollar profit shown in the accounts.

Depreciation of meters, stoves, &c., on hire is $21,581, or $10,116 less than for the previous year. Depreciation is charged at a fixed percentage on the Sterling balances and then converted into dollars at the average exchange rate. The higher rate ruling during 1935 accounts for the lesser figure.

On the credit side of the Hong Kong Revenue Account gas rentals is lower by $102,688, which is mostly accounted for by lower consumption and the fact that as from July 1, 1935, a reduction of 50 cents per 1,000 cu.ft. of gas was made in the basis price. As, however, the dollar slumped considerably during the latter months of 1935, the Company was forced to review their charges and were reluctantly compelled, owing solely to the exchange position, to revert to the former charge of $4 per 1,000 cu.ft., less varying discounts for larger quantities consumed, as from Jan. 1 last.

The revenue obtained from the rental of meters and fittings of $85,358 compares very favourably with the previous years' figure of $86,596. Residual products is lower by $22,133, the sales of both coke and tar are slightly less than the previous year and the prices of these residuals have been slightly reduced during the year.

Thirty-three additional public lamps have been fixed during 1935, twenty at Hong Kong and thirteen at Kowloon. Particular attention is given to this section of our business and our Manager is kept well posted up with the latest developments in gas street lighting.

The profit on Exchange shown in the London Revenue Ac-

count at £2,536 5s. 7d. is mostly due to the favourable exchange rates at which remittances during the year were obtained. The profit of the London Revenue Account is £23,569 4s. 3d., which compares very favourably with that of £23,968 19s. 9d. for the preceding year. It will, of course, be appreciated that the higher average exchange rate which prevailed throughout the year has materially assisted the Company.

I do not think there are any items of particular interest in the Net Revenue Account which require special mention, so I will now deal with the General Balance-Sheet. You will notice that our Local Bank Loan in Hong Kong at Dec. 31 last stands at £29,127 16s. 4d. or £11,686 higher than at Dec. 31, 1934, the increase being due to the borrowing for further work undertaken at the Company's new Works at Kowloon.

It will interest shareholders to know that we have now completed the laying of high-pressure steel mains at both Hong Kong and Kowloon ready for when the opportune time arrives to lay the under-water cross-harbour section, which will then connect up the gas supply between the two places.

At our last Annual General Meeting I referred to the arrangements made whereby the Company had acquired a new site at Kennedy Town for the re-erection of our West Point 500,000 cu.ft. capacity gasholder. This work has now been completed, and the holder was put into commission early in December and the item appearing in the Accounts under the heading of Gasholder Suspense Account £13,984 6s. 9d. includes the total cost of this work.

Our Investments in London stand at the book value of £9,772 10s. 6d., although the market value of same at Dec. 31 last amounted to £11,571.

When reviewing the conditions of trade which prevailed in the Colony throughout the whole of the year the Directors consider that the Accounts as now before the Meeting can be regarded as very satisfactory. Signs of trade recovery are reported and your Board look forward with confidence to the future prosperity of the Colony with resultant benefit to this Company.

During the period under review, our Manager, Mr. H. E. Stone, has been home on furlough, and your Board have therefore had the benefit of discussing and reviewing the Company's business personally with him.

While in England, Mr. Stone also visited various manufacturers of gas plant and appliances so as to be fully acquainted with the latest developments which are taking place in this country. Our Manager returned to the Colony during December last for a further period of service with the Company and has since reported that he found all well on his arrival.

I now have much pleasure in moving that the Report and Accounts be received and adopted.

Mr. ALEX. A. JOHNSTON seconded the Resolution, which was carried unanimously.

The CHAIRMAN then moved the following Resolution:

> "That a Dividend on the Company's Capital at the rate of 8% per annum, subject to Income Tax, be declared for the year ended Dec. 31, 1935, less 4% Interim Dividend paid Sept. 28, 1935, the Warrants to be made payable on April 4, 1936,"

which was seconded by Major HERIOT R. GLEN and unanimously carried.

The re-election of Major Heriot R. Glen as a Director was proposed by Mr. H. ROYSTON ASKEW, who said: "It gives me very much pleasure indeed. Major Glen has been on this Board for many years and throughout has shown not only a real knowledge of the Company's affairs but also a great keenness."

Mr. ALEX. A. JOHNSTON, who entirely endorsed Mr. Askew's remarks, seconded the proposition, which was carried unanimously. Major GLEN thanked the meeting and assured them that the work was very much a labour of love.

Mr. A. E. HAYES proposed the re-election of Messrs. Cash, Stone, & Co., as Auditors for the ensuing year at the usual fee, which was seconded by Mr. A. W. OKE and unanimously carried.

The CHAIRMAN then moved a vote of thanks to the Staff in Hong Kong and London. He said the Company was certainly very well served by its staff. At times in Hong Kong, conditions were very trying and we were up against very keen competition but our staff seem to maintain their health and render good service. As regards our London Staff, it is a small one, but we believe in quality not quantity and we have quality. For example, the issue of new debentures with the vast quantity of detailed work involved was carried through without a fault by the London staff and without any additional assistance. We are very satisfied with our London Staff so ably headed by Mr. Field.

Mr. A. W. OKE seconded the vote which was carried unanimously.

A vote of thanks to the Chairman and Directors was proposed by Mr. A. W. OKE, who remarked on the very full speech the Chairman gives which anticipates all their questions. Mr. A. E. HAYES seconded, and the resolution was carried unanimously.

The CHAIRMAN briefly responded and the proceedings then terminated.

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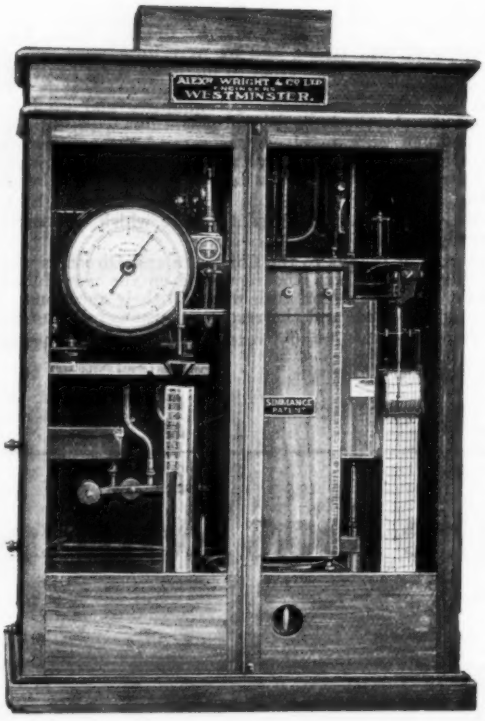

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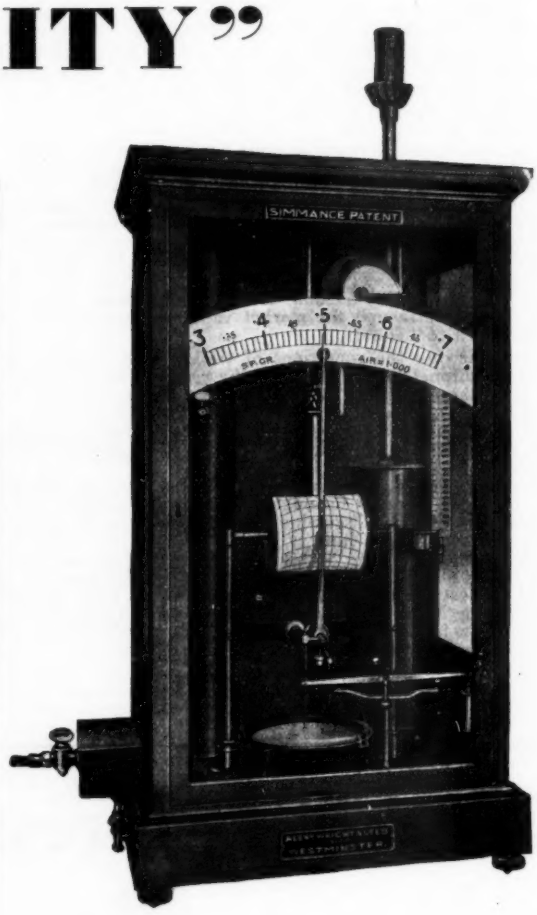

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Gas Markets and Manufactures

Stock Market Report

(For Stock and Share Lists, see later pages)

The political troubles were almost completely overshadowed last week by the good news of the Budget surplus. After weak opening markets quickly responded and became more active than for some time past, while under the lead of British Funds prices in most sections improved in value. Home rails went still further ahead, a feature being the strength of L.M.S. 1923 preference. In the Industrial market, iron and steel shares again became popular, and there was a good demand for motor and aviation shares. The holiday will doubtless tend to lessen the volume of business during the current week, but the general indication is that investors have to come to the conclusion that international affairs, though they will probably keep diplomatic circles busy for some time to come, need not deprive them of the benefits of the strong financial position at home, and a speedy return to normal activity is anticipated.

The heavy turnover in the more spectacular issues led to a slight falling off in the volume of business in gas stocks and shares, except of course those of the leading undertakings for which there is always a keen demand. Prices, however, were well maintained and a few quotations closed higher, including, on the London Exchange, a gain of 3 points each in South Metropolitan to 124½ and Montevideo to 67½. At the Provincial Exchanges, Blyth ordinary recorded a sharp rise of 6 to 155, at which price the yield on a dividend of 8% is £5 3s. 2d.%, and a demand for Newcastle units took the price up 1s. to 26s.

A feature of the week was the success of the Gas Light and Coke Company's issue of £700,000 3½% redeemable debenture stock, 1956, at par which was offered on Friday last. The issue was oversubscribed, and the list closed at 9.5 a.m. the same day.

Particulars of another issue received last week relate to the Lea Bridge District Gas Company, which is offering for sale by tender £30,000 4% irredeemable preference stock at a minimum of £105%, at which price the yield is £3 16s. 2d.%. The balance available last year after meeting interest charges was sufficient to cover the preference dividend, including the present issue, nearly four times. Tenders must reach the Company by 11 o'clock on Tuesday next, April 14.

Current Sales of Gas Products

The London Market for Tar Products.

April 6.

There is little change to record in the tar products market, prices being about as follows:

Pitch is nominal at about 40s. per ton f.o.b.

Creosote, 5¼d. per gallon.

Refined tar, 3⅜d. per gallon in bulk at makers' works.

Pure toluole, about 2s. 8d.; pure benzole, 1s. 7d. to 1s. 8d.; 95/160 solvent naphtha, about 1s. 8d.; and 90/160 pyridine, about 4s. 3d. to 4s. 6d.—all per gallon naked at makers' works.

Tar Products in the Provinces.

April 6.

The average prices of gas-works products during the week were: Gas-works tar, 24s. 3d. to 29s. 3d. Pitch—East Coast, 42s. 6d. to 45s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 42s. 6d. to 45s.* Toluole, naked, North, 2s. 2d. to 2s. 4d. Coal-tar crude naphtha, in bulk, North, 8d. to 8¼d. Solvent naphtha, naked, North, 1s. 6d. to 1s. 6¾d. Heavy naphtha, North, 1s. to 1s. 1d. Creosote, *ex* works, in bulk, North, liquid and salty, 4⅜d. to 4⅞d.; low gravity, 4⅜d. to 4⅝d. Heavy oils, in bulk, North, 4¾d. to 5d. Carbolic acid 60's, 2s. 4d. to 2s. 6d. Naphthalene, £19 to £21. Salts, 95s. to 100s., bags included. Anthracene "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *April* 4.

There is a continued demand for all tar products excepting pitch.

Crude gas-works tar.—The actual value is 32s. to 33s. per ton *ex* works in bulk.

Pitch continues to be offered freely at 35s. to 37s. 6d. per ton f.o.b. Glasgow for export, and 35s. per ton *ex* works in bulk for home trade.

Refined tar.—Value of this can still be taken at round 3d. per gallon f.o.r. makers' works, naked.

Creosote oil.—With the approaching seasonal increase in demand prices are steady to firm as follows: B.E.S.A. Specification, 5¼d. to 5⅜d. per gallon; low gravity, 5¼d. to 5½d. per gallon; and neutral oil, 5¼d. to 5½d. per gallon; all f.o.r. in bulk.

Cresylic acid.—There is practically nothing now available for prompt delivery and values are therefore nominal as follows: Pale, 97/99%, 1s. 8d. to 1s. 9d. per gallon; dark, 97/99%, 1s. 5½d. to 1s. 6½d. per gallon; and pale, 99/100%, 1s. 11d. to 2s. per gallon; all *ex* works naked.

Crude naphtha continues to find a steady outlet at 5¼d. to 5⅜d. per gallon, according to quality and district.

Solvent naphtha.—90/160 grade is 1s. 4½d. to 1s. 5½d. per gallon, and 90/190 heavy naphtha is 1s. to 1s. 1d. per gallon.

Motor benzole is only available in small quantities at 1s. 3½d. to 1s. 4d. per gallon in bulk at makers' works.

Pyridines.—90/160 grade is 5s. to 5s. 6d. per gallon, and 90/140 grade is 5s. 6d. to 6s. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s. d.		s. d.	
Crude benzole . . .	0 8½	to	0 9	per gallon at works
Motor ,, . . .	1 2	,,	1 2½	,, ,, ,,
90% ,, . . .	1 3	,,	1 3½	,, ,, ,,
Pure ,, . . .	1 7	,,	1 7½	,, ,, ,,

Contracts Advertised To-Day

Mainlaying, &c.

Lincoln Gas Department. [p. 128.]
Sidmouth Gas Department. [p. 128.]

Pipes.

Lincoln Gas Department. [p. 128.]
Sidmouth Gas Department. [p. 128.]

Retorts.

Brighouse Gas Department. [p. 128.]

Trade Notes

Tully Plant for Berwick.

The Berwick and Tweedmouth Gaslight Company have placed an order with Tully, Sons, & Co., Ltd., for a 100,000 cu.ft. per day capacity "Tully" patent oil carburetted coal gasification plant complete with waste-heat boiler, mechanical operator, and washer scrubber.

"Pegson" Power Rammers.

We have received from Messrs. Pegson, Ltd., Coalville, Leicestershire, a copy of their new publication dealing with various applications of their power rammers. Examples are given of work carried out in aerodromes, water works, foundation consolidation, at the new Earl's Court Exhibition buildings, and, in fact, "wherever earth is to be consolidated." Special attention is drawn to the advantages conferred by magneto ignition.

Gas Undertaking Result

Devon Gas Association, Ltd.

The Devon Gas Association, Ltd., has had a year of steady progress and reports an increase of 3·3% in the sale of gas. The popularity of the slot meter continues to develop, the combined sale of gas now being just under 100 million cu.ft. per annum. The Association have been able to retain much of the public lighting. Two contracts for a period of three years have been recently settled in their favour. Encouraged by the growth of the town of Lyme Regis it has been decided to develop that Gas Undertaking. New showrooms and weighbridge have been provided and new mains have been laid to supply gas to Charmouth, which is becoming popular as a health resort. Various housing schemes, which include 250 houses, are in progress. The expenditure on new plant at Lyme Regis, the extension to Charmouth, and their normal progress will be met during the year by the issue of further capital, which it is proposed to offer to the existing shareholders at a reasonable premium. Although it is impossible to supply gas at the cheaper prices ruling in the larger towns, the Association have kept their rates as low as possible, and with improved efficiency consumers now have available all the advantages of modern gas apparatus. The usual dividend of 7½% is declared on the ordinary shares for the fifteenth consecutive year.

Get the most out of every class of coal in every size of works by adopting

THE WEST SYSTEMS

- GLOVER-WEST VERTICAL RETORTS
- WESTVERTICAL CARBONIZING CHAMBERS
- COAL AND COKE-HANDLING & PREPARATION

Orders for Glover-West vertical retort installations have been received during the present year from the Dudley, Brierley Hill & District Gas Company (3rd order), the Kelso Gas Company, Ltd., the Altrincham Gas Company (3rd order), the Bilston Gas, Light & Coke Company (2nd order), and the Grangemouth Corporation Gas Department (2nd order).

- Carbonizing plants have been recently put into commission at Stratford-on-Avon, Buxton, Kilsyth, Montrose (2nd order), Manchester (6th order), Slough, Johannesburg (2nd order), St. Helens (4th order), St. Albans and Willenhall.

WEST'S GAS IMPROVEMENT COMPANY, LTD.

MANCHESTER: Albion Ironworks, Miles Platting 'Phone: COLLYHURST 2961 : 'Grams: "STOKER, MANCHESTER"

LONDON: Columbia House, Aldwych, W.C.2 'Phone: HOLBORN 4108 : 'Grams: "WESGASCO, ESTRAND, LONDON"

STOCK AND SHARE LIST

Official Quotations on the London Stock Exchange

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Apl. 3.	Rise or Fall on Week.	Transactions, Lowest and Highest Prices During the Week.
1,767,439	Stk.	Mar. 16	7	7⅛	Alliance & Dublin Ord. ...	150—160	...	155
374,000	,,	Dec. 16	4	4	Do. 4 p.c. Deb. ...	95—100	...	...
557,655	,,	Feb. 17	7	7	Barnet Ord. 7 p.c.	167—172	...	...
300,000	1	Mar. 30	1/4½	1/9⅛	Bombay, Ltd.	1¼—1⅝*	−1/16	...
179,305	Stk.	Mar. 2	9½	9½	Bournemouth sliding scale ...	218—228	...	...
590,407	,,	,,	7	7	Do. 7 p.c. max. ...	169—174	...	...
493,960	,,	,,	6	6	Do. 6 p.c. Pref. ...	148—153	...	...
50,000	,,	Dec. 16	3	3	Do. 3 p.c. Deb. ...	85—90	...	...
262,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	105—110	...	109
335,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	125—130	...	...
357,900	,,	Feb. 17	7½	7½	Brighton, &c., 6 p.c. Con. ...	170—175	...	...
649,955	,,	,,	6½	6½	Do. 5 p.c. Con. ...	155—160	...	158—159
205,500	,,	,,	6	6	Do. 6 p.c. 'B' Pref.	144—149	...	...
855,000	,,	Mar. 2	7	8	British Ord.	158—163	...	161—162
100,000	,,	Dec. 16	7	7	Do. 7 p.c. Pref.	153—158	...	156—156½
350,000	,,	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	96—101	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	107—112	...	...
200,000	,,	,,	17/6§	3½	Do. 3½ p.c. Red. Deb. ...	98—100	...	...
100,000	10	22 May '33	6	4	Cape Town, Ltd.	1—3	...	...
100,000	10	6 Nov.'33	4½	4½	Do. 4½ p.c. Pref. ...	1—3	...	...
150,000	Stk.	Jan. 6	4½	4½	Do. 4½ p.c. Deb. ...	81—86	...	...
626,860	,,	Feb. 3	6	6	Cardiff Con. Ord.	130—135	...	...
237,860	,,	Dec. 16	5	5	Do. 5 p.c. Red. Deb.	110—115	...	112
98,936	1	Sept. 23	2/-	2 -	Colombo, Ltd., Ord.... ...	1⅝—1⅞	...	...
24,500	1	,,	1/4½	1/4½	Do. 7 p.c. Pref. ...	20/—22/-	...	...
609,204	1	Mar. 30	-/11·48	- 11·48	Colonial Gas Assn. Ltd. Ord.	19/—21/-*	—/6	...
296,053	1	,,	1/3·30	1/3·30	Do. 8 p.c. Pref	23/—25/-*	—/6	...
1,775,005	Stk.	Feb. 3	5	5	Commercial Ord.	99—103	...	...
620,000	,,	Dec. 2	3	3	Do. 3 p.c. Deb. ...	85—90	...	...
286,314	,,	Feb. 17	5	5	Do. 5 p.c. Deb. ...	120—125	...	...
807,560	,,	,,	7	7	Croydon sliding scale ...	158—163	...	161½—162
644,590	,,	,,	5	5	Do. max. div. ...	114—119	...	...
620,385	,,	Dec. 16	5	5	Do. 5 p.c. Deb.... ...	121—126	...	123
239,000	,,	Feb. 3	5	5	East Hull Ord. 5 p.c.... ...	107—110	...	109½
184,555	,,	Feb. 17	6	6	East Surrey Ord. 5 p.c. ...	130—135	...	...
176,211	,,	Dec. 16	5	5	Do. 5 p.c. Deb. ...	122—127	...	...
19,284,128	,,	Feb. 3	5½	5½	Gas Light & Coke 4 p.c. Ord.	27/3—28/3a	...	27/9—28/1½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.... ...	89—92	...	91½
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	105—108	−2	105½—107½
8,602,497	,,	Dec. 2	3	3	Do. 3 p.c. Con. Deb. ...	87—92	...	88½—90
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	117—120	...	117½—118½
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	114—117	...	115—116½
270,466	,,	Feb. 17	6	6	Harrogate New Cons. ...	130—135	...	...
157,500	1	Mar. 16	1/7½	1/7½	Hongkong & China, Ltd. ...	1⅞—1⅞	...	...
213,200	Stk.	Mar. 2	6	6	Hornsey Con. 3½ p.c. ...	135—140	...	...
5,600,000	,,	Nov. 4	14	8	Imperial Continental Cap. ...	170—180	−5½	170—180½
223,130	,,	Jan. 20	3½	3½	Do. 3½ p.c. Red. Debs.	92—97	...	94½—95½
285,242	,,	Feb. 17	8½	8½	Lea Bridge 5 p.c. Ord. ...	175—180	...	...
165,736	,,	Mar. 16	8	10	Maidstone 5 p.c. Cap. ...	180—190*	...	...
63,480	,,	Dec. 16	3	3	Do. 3 p.c. Deb. ...	80—85	...	...
75,000	,,	Dec. 2	†10	†10	Malta & Mediterranean ... Metropolitan (of Melbourne)	200—210	...	...
392,000	—	Apl. 1	5½	5½	5½ p.c. Red. Deb.	102—107*	...	...
231,978	Stk.	Feb. 17	5	5	M.S. Utility 'C' Cons. ...	110—115	...	...
818,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	102—107	...	105½
360,075	,,	Dec. 16	4	4	Do. 4 p.c. Deb. ...	103—108	...	106
148,955	,,	,,	5	15	Do. 5 p.c. Deb. ...	123—128	...	...
125,000	—	Jan. 2	3½	3½	Do. 3½ p.c. Rd. Rg. Bds.	96—99	...	...
675,000	Stk.	Nov. 18	†13	†13	Montevideo, Ltd.	65—70	+3	66—67
225,000	,,	Feb. 17	7½	7½	North Middlesex 6 p.c. Con.	169—174	...	...
396,160	,,	Feb. 3	5	5	Northampton 5 p.c. max. ...	108—113	...	...
300,000	,,	Nov. 4	†7	†9	Oriental, Ltd....	167—172	...	...
416,617	,,	Dec. 16	8	8	Plymouth & Stonehouse 5 p.c.	166—171	...	...
504,416	,,	Feb. 3	8½	8½	Portsm'th Con. Stk. 4 p.c. Std.	170—175	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	108—113	...	...
114,000	,,	Feb. 3	5	5	Preston 5 p.c. Pref. ...	110—115	...	...
321,961	1	Sept. 23	...	1/-	Severn Va'. Gas Cor. Ld. Ord.	22/—23/-	...	22/—22 6
319,510	1	Mar. 16	-/10½	-/10½	,, ,, 4½ p.c. Cum. Pref.	21 6—22/6	...	22 1½
133,201	Stk.	Feb. 17	8½	5	Shrewsbury 5 p.c. Ord. ...	147—152	...	...
90,000	10	May 27	‡3	‡3½	South African...	3—4	...	...
1,061,779	1	Sept. 23	1/2½	1/2⅝	South East'n Gas Cn. Ld. Ord.	27/—29 -	...	27/—28/-
845,016	1	Mar. 16	-/10½	-/10½	Do. 4½ p.c. Red. Cum. Pref.	21 —23 -	...	21/4½—22/1½
200,000	1	,,	4	4	Do. 4 p.c. Cum. Pref. ...	20 9—21 9	...	...
450,000	Stk.	Feb. 17	4	4	Do. 4 p.c. Red. Deb. ...	101—104	...	...
6,709,895	,,	Feb. 3	5	6½	South Met. Ord.	123—126	+3	121½—125½
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf....	147—152	...	148—150
850,000	,,	,,	4	4	Do. 4 p.c. Irred. Pf....	104—107	...	105½
1,895,445	,,	Dec. 16	3	3	Do. 3 p.c. Deb. ...	89—92	+1	92
1,000,000	,,	Jan. 6	5	5	Do. 5 p.c. Red. Deb.	114—117	...	...
1,543,795	,,	Feb. 3	6	6	South Suburban Ord. 5 p.c....	130—135	...	133—135
512,825	,,	,,	5	5	Do. 5 p.c. Pref....	122—127	...	...
500,000	,,	,,	4	4	Do. 4 p.c. Pref....	103—108	...	...
888,587	,,	Dec. 16	5	5	Do. 5 p.c. Deb....	123—128	...	...
250,000	,,	,,	4	4	Do. 4 p.c. Deb....	104—109	...	...
415,907	,,	Dec. 2	...	4	S. Western Gas & Water Ord.	23/—24/-	...	...
160,523	,,	Oct. 21	...	...	Do. 4½% Red. Cum. Pref.	22/—23/-	...	...
110,000	,,	Dec. 16	4	4	Do. 4% Red. Deb. ...	98—103	...	...
647,740	,,	Feb. 3	5	5	Southampt'n Ord. 5 p.c. max.	113—118	...	...
121,275	,,	Dec. 16	4	4	Do. 4 p.c. Deb.	98—103	...	...
350,000	,,	Feb. 3	5½	5½	Swansea 5½ p.c. Red. Pref. ...	111—116	...	...
106,000	,,	Dec. 16	6½	6½	Do. 6½ p.c. Red. Deb. ...	96—101	...	...
94,000	,,	...	...	...	Do. 3½ p.c. Red. Deb. ...	96—101	...	...
1,076,490	,,	Feb. 17	6½	6½	Tottenham and District Ord.	149—154	...	...
409,835	,,	,,	5½	5½	Do. 5½ p.c. Pref....	130—135	...	...
62,235	,,	,,	5	5	Do. 5 p.c. Pref. ...	122—127	...	...
371,850	,,	Dec. 2	4	4	Do. 4 p.c. Deb. ...	103—108	...	107½—108
369,774	,,	Feb. 3	7	7	Uxbridge, &c., 5 p.c. ...	153—158	...	...
108,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	122—127	...	126½
1,340,521	,,	Feb. 3	7	7	Wandsworth Consolidated ...	158—163	...	160—162
1,371,373	,,	,,	5	5	Do. 5 p.c. Pref. ...	122—127	...	123—125
1,317,964	,,	Dec. 16	5	5	Do. 5 p.c. Deb. ...	123—128	...	...
338,300	,,	,,	4	4	Do. 4 p.c. Deb. ...	104—109	...	...
499,735	,,	Feb. 17	6½	7½	Watford and St. Albans Ord.	155—160	...	159
200,000	,,	,,	5	5	Do. 5 p.c. Pref. ...	120—125	...	...
200,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	133—138	...	...
200,000	,,	Dec. 2	4	4	Do. 4 p.c. Red. Deb.	100—105	...	...
100,000	,,	,,	...	3½	Do. 3½ p.c. Red. Deb.	96—101	...	...
158,400	,,	Mar. 2	5	6b	Winchester W. & G. 5 p.c. Con.	112—117	...	...

a.—The quotation is per £1 of Stock. b.—Paid £3, including 10s. on account of back dividends. * Ex div.
† Paid free of income-tax. ‡ For year. § Actual for three months.

Stock and Share List continued overleaf.

"Modern Gas Fitting"

PART VI.

of

Gas Fitting Pamphlets

Another of the Popular Series of reprints, in booklet form, of the articles on "Modern Gas Fitting," contributed monthly to the

"GAS SALESMAN"

by

R. N. LeFevre, M.Inst.Gas E.

Officer-in-Charge of Training, The Gas Light and Coke Company, Assistant Head of Department of Gas Engineering and Supply, Westminster Technical Institute.

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Parts I to V have been reprinted, and can also be supplied.

STOCK AND SHARE LIST—Cont.

Stocks Officially Quoted on Provincial Exchanges

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. Apl. 3.	Rise or Fall on Week.	Transactions, Lowest and Highest During the Week.
BRISTOL EXCHANGE.								
347,756	Stk.	Feb. 3	5	6	Bath Cons.	124—126	...	...
1,667,250	,,	Feb. 17	5	5	Bristol, 5 p.c. max.	119—121	...	...
120,420	,,	Dec. 16	4	4	Do. 1st 4 p.c. Deb. ...	103—105	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	103—105	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	125—128	...	...
274,000	,,	Feb. 17	5	5	Newport (Mon.) 5 p.c. max....	111—116	...	...
13,200	12	Mar. 16	7	8½	Pontyp'l Gas & W. 10 p.c. 'A.'	14—15	...	...
13,600	10	,,	5	6	Do. 7 p.c. B.'	11½—12	...	...
40,000	10	,,	5	6	Do. 7 p.c. 'C.'	11½—12	...	...
140,778	Stk.	Feb. 17	5	5	Weston-super-Mare Cons. ...	113—115	...	...
64,338	,,	Dec. 16	4	4	Do. 4 p.c. Deb.	98—100	...	...
33,340	,,	,,	7½	7½	Do. 7½ p.c. Deb.	165—169	...	...
LIVERPOOL EXCHANGE.								
157,150	Stk.	Feb 3	5	6½	Chester 5 p.c. Ord.	107½—112½	...	...
92,500	,,	Dec. 16	4	4	Do. 4 p.c. Pref.	100—105	...	...
32,540	,,	,,	3½	3½	Do. 3½ p.c. Deb. ...	91—96	...	...
41,890	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	100—105	...	...
2,167,410	,,	Feb. 17	6	6	Liverpool 5 p.c. Ord. ...	134—136	...	...
245,500	,,	Dec. 16	5	5	Do. 5 p.c. Red. Pref. ...	103—108	...	...
306,083	,,	Jan. 6	4	4	Do. 4 p.c. Deb. ...	105—107	...	...
106,280	,,	Feb. 3	10	10	Preston 'A' 10 p.c. ...	202—212	...	...
189,219	,,	,,	7	7	Do. 'B' 7 p.c.	140—150	...	...
NEWCASTLE EXCHANGE.								
122,577	Stk.	Mar. 2	8	8	Blyth 5 p.c. Ord.	154—156	+6	...
732,000	,,	Feb. 3	5	5	Hartlepool G. & W. Co. & New	122—124	...	...
2,061,315	,,	Feb. 3	5	5½	Newcastle & Gateshead Con.	25 6—26 6*a*	+1/-	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	106½—107½	...	...
776,706	,,	Dec. 16	3½	3½	Do. 3½ p.c. Deb. ...	100½—101½	...	...
277,285	,,	Oct. 21	5	5	Do. 5 p.c. Deb. '43...	105—106	...	...
209,820	,,	Mar. 2	8½	8½	South Shields Con.	171—173	...	...
299,542	,,	Feb. 3	6	6	Sunderland 6 p.c. max. ...	129—131	...	...
NOTTINGHAM EXCHANGE.								
542,270	Stk.	Feb. 17	7	10	Derby Con.	175—185	...	...
55,000	,,	Dec. 16	4	4	Do. 4 p.c. Deb.	100—105	...	...
84,750	,,	Feb. 17	5	12	Long Eaton 'A' Ord. ...	150—160	...	...
50,000	,,	,,	4	10	Do. 'B' Ord. ...	130—140	...	...
20,000	10	Dec 16	5	5	Do. 5 p.c. Pref. ...	10—12	...	...
80,000	Stk.	,,	5	5	Do. 5 p.c. Deb. ...	117—122	...	...
SHEFFIELD EXCHANGE.								
10,000	Stk.	Feb. 17	10	10	Great Grimsby 'A' Ord. ...	220—230	...	...
6,500	,,	,,	10	10	Do. 'B' Ord. ...	220—230	...	...
79,000	,,	,,	10	10	Do. 'C' Ord. ...	205—215	...	...
1,806,339	,,	Feb. 17	6	6	Sheffield Cons.	145—148	+1	...
95,000	,,	Dec. 16	4	4	Do. 4 p.c. Deb.... ...	100½—102½	...	...

a The quotation is per £1 of Stock.

Supplementary List of Stocks and Shares not Officially Quoted

202,152	Stk.	...	...	...	Ascot Ord.	119—124	...	...
128,182	,,	...	...	...	Do. 5 p.c. Pref.	117—122	...	...
90,000	1	Nov. 4	5	5	Assd. Gas and Water Ord....	21/—23/-	...	...
90,000	1	,,	4½	4½	Do. 4½ p.c. Cum. Pref. ...	22/—23/-	...	...
17,000	Stk	Feb. 17	8	8	Bognor Orig. Ord. 'A' ...	162—172	...	...
62,210	,,	,,	8	8	Do. New Addl. 'A' ...	162—172	...	...
87,160	,,	,,	7	7	Do. New 7 p.c. max. ...	140—145	...	...
37,440	,,	Feb. 3	10	10	Cam.Univ. & Town 10 p.c.max.	210—220	...	...
125,970	,,	,,	7	7	Do. 7 p.c. max.	158—163	...	...
39,025	,,	,,	5	5	Do. 5 p.c. max.	108—113	...	...
65,000	,,	Mar. 2	7½	8½	Eastbourne 'A' 5 p.c. ...	160—165	...	...
198,000	,,	,,	6	7	Do. 'B' 3½ p.c.	133—138	...	133½
112,312	,,	,,	5	5	Do. 5 p.c. Pref.	120—125	...	120
130,000	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	122—127	...	...
250,000	1	Nov. 18	...	4	Gas Consolidation Ord. ...	20/6—22/6	...	...
250,000	1	,,	...	4	Do. 4 p.c. Red. Cum. Pref.	19/6—20/6	...	20/-
117,251	Stk.	Sept. 23	8 1/9	8 1/9	Gosport District Cons. ...	...	...	...
73,350	,,	,,	5	5	Do. 5 p.c. Pref.	...	...	...
24,000	30	Feb. 3	8½	8½	Great Yarmouth 8½ p.c. max.	52—57	...	...
59,400	30	,,	7½	7½	Do. 7½ p.c. max.... ...	42—45	...	...
51,160	Stk.	Dec. 2	5½	5½	Do. 5½ p.c. Deb.... ...	123—128	...	...
152,600	,,	Mar. 2	8	8	Guildford Cons.	185—195	...	...
54,055	,,	,,	5	5	Do. 5 p.c. Pref.	114—119	...	...
68,250	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	120—125	...	...
156,600	,,	Feb. 3	7½	7½	Hampton Court Cons. ...	167—177	...	...
81,660	10	Feb 4,'35	5	9	Leatherhead Ord.	16—17	...	...
107,960	10	Mar. 16	4	5½	Mid Kent Ord.	9½—10½	...	...
230,940	Stk.	Feb. 17	10	10	Oxford & District Ord. ...	205—215	...	...
47,112	,,	,,	5	5	Do. 5 p.c. Pref.	118—123	...	118
50,000	,,	,,	6	6	Do. 6 p.c. Red. Pref. ...	113—118	...	...
126,193	,,	Nov. 18	7½	7½	Peterborough Ord.	160—170	...	...
64,990	,,	Mar. 16	7½	7½	Redditch Ord.	113—118	...	...
166,850	,,	Feb. 17	7	9	Romford Ord.	167—172	...	...
60,000	,,	,,	4	4	Do. 4 p.c. Pref.	97—100	...	...
44,000	,,	Mar. 16	5	5	Do. 5 p.c. Deb.	120—125	...	...
10,950	,,	Mar. 2	8	8	Ryde Ord.	165—170	...	...
136,191	,,	Feb. 3	5	7	Scarborough Ord.	128—138	...	...
27,825	,,	Feb. 3	8	8	Shanklin & Ventnor Cons. ...	152—162	...	...
40,643	,,	Mar. 2	7	7	Slough Ord.	147—152	...	...
221,000	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	116—121	...	118—119
28,872	1	Nov. 4	5½	5½	S. Midland Gas Cpn.Ltd. Ord.	20/—22/-	...	...
28,866	1	Mar. 16	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	19/6—21/6	...	...
137,730	Stk.	Feb. 17	7	7	Southgate & Dist. 7 p.c. max.	148—153	...	...
62,500	,,	,,	5	5	Do. 5 p.c. Pref.	115—120	...	...
117,228	,,	Mar. 2	5	6	Swindon Cons.	111—116	...	...
60,425	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	122—127	...	...
50,000	1	Mar. 30	...	5·52d.	*a* Utd. Kingdom Gas Cpn. Ord.	1 1/16—1 3/16*	...	21/-
760,910	1	,,	2½	2½	Do. 4½ p.c. Prefd. Ord....	20/—22/-*	...	20/3—21/-
110,910	1	,,	...	2½	Do. 4½ p.c. Cum. Pref. ...	20 6—22/6	...	...
900,000	Stk.	Mar. 16	...	3½	Do. 3½ p.c. Red. Deb. ...	98—101	...	...
130,000	,,	Feb. 3	5	8	Wakefield Ord.	137—142	...	...
81,650	,,	,,	5	5	Do. 5 p.c. max.	101—106	...	...
82,000	,,	Feb. 3	6	6	Weymouth Ord.	106—111	...	...
370,000	,,	Feb. 3	4	6	York Cons.	108—113	+1	111½—112
90,000	,,	Dec. 16	5	5	Do. 5 p.c. Red. Deb. ...	103—108	...	...
133,640	,,	Feb. 3	6½	6½	Yorktown (Cam.) 5 p.c. Cons.	127—132	...	...
120,000	,,	,,	5	5	Do. 5 p.c. Pref.	115—120	...	...
35,000	,,	Dec. 16	5½	5½	Do. 5½ p.c. Deb.... ...	130—135	...	...

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